

समीकरणसंग्रह

हायथ

इंग्रजी भाषेतील ग्रंथांच्या साहाय्याने शाब्दातील व घरगु-

ती शिकणारांच्या उपयोगासाठी

वेनबस अप्पा धारवाडकर

यांनी तयार केला.

मुकाम पुणे.

विठ्ठल सरवाराम अप्पिहोत्री यांचे छापसा-

त्यांत छापिला.

शके १९७९

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प्रस्तावना.

आलीकडे गणिताचा अभ्यास बराच वाढत चालला आहे. या सु-
 खेनं कित्येक भाषांतरे व नवीन ग्रंथ तयार होत आहेत ही एक मोठी आनं-
 दाची गोष्ट आहे. या विद्येनें ज्ञान हिंदुस्थानांत पूर्वी बरेच होते; परंतु या
 विषयावरील ग्रंथ संस्कृत भाषेंत असल्या सुखे त्यांपासून सर्वास उपयो-
 ग होत नसे. आतां देशभाषेंत ग्रंथ पुष्कळ होत चालल्या सुखे त्यांचा उ-
 पयोग सर्वास होतो. अशा वेळेस बीज गणितांतील समीकरणें एकत्र
 जमवून सोडविलीं असतां उपयोगी पडतील अशा उद्देशानें ह्या लहान-
 सा ग्रंथ तयार केला आहे.

प्रथमतः हा ग्रंथ सुमारे पंचवीस तीस पत्रां चा करून छापवा-
 असा अभिप्राय होता परंतु शेवटीं होतां होतां सुमारे १४० पृष्ठें झालीं.
 तथापी बीजगणिताचे इतर पुष्कळ विषय घालावयाचे राहिले. याज-
 करितां थोडक्याच दिवसांनीं दोन अक्षरी व तीन अक्षरी समीकरणें व
 पनसमीकरणें व चतुर्घातसमीकरणें सोडविण्याच्या रीती व रीति विना

यांचें एक पुस्तक छापवें असा उद्देश आहे. या ग्रंथांत बर्गसमीकरणें
सोडविण्याच्यारीति सांगितल्या आहेत त्या संस्कृत बीजगणितांतील
घेतल्या आहेत. इंग्रजी भाषेतील प्रख्यात गणित शास्त्रज्ञ **ब्लॉड, उड,**
रिगली, कोलेंजो, आणि हडन यांच्या ग्रंथांतून बहुतकरून
कठीण समीकरणें एथें घेतली आहेत व कित्येक नवीनही केलीं आ-
हेत. सोडविण्याकरितां जी उदाहरणें ग्रंथाच्या शेवटीं दिली आहेत,
तां प्रायः नवीन आहेत. आतां विद्वज्जनांस नवता पूर्वक इतकीच प्रा-
र्थना आहे कीं लेखकाच्या किंवा ग्रंथकर्त्याच्या नजर चुकीनें ज्या चुका
या ग्रंथांत राहिल्या असतील त्यांकडे लक्ष न देतां केवळ गुणाचें ग्र-
हण करावें.

$$a = \frac{a+b}{2} + \frac{a-b}{2} \text{ आणि } b = \frac{a+b}{2} - \frac{a-b}{2}$$

$$(a+b)(a-b) = a^2 - b^2; (2+8)(3-8) = 9-64$$

$$1^2 = 1; 4^2 = 16; 9^2 = 81; a^2 = 1, 4, 9, 16, 25, \dots$$

$$\frac{a^2 - b^2}{a+b} = \frac{a-a^2+b^2}{a+b}, \frac{a^2 - b^2}{a-b} = \frac{a^2 - a^2 + a^2 - b^2 + b^2 - b^2}{a-b}$$

$$\frac{a^2 - b^2}{a+b} = a-b + \frac{2b^2}{a+b}, \frac{a^2 - b^2}{a-b} = \frac{a^2 - a^2 + a^2 - b^2 + b^2 - b^2}{a-b}$$

$$\frac{a^2 - b^2}{a-b} = \frac{a^2 - a^2 + a^2 - b^2 + b^2 - b^2}{a-b} = \frac{a^2 - b^2}{a-b}$$

$$\frac{a^2 - b^2}{a-b} = a+b + \frac{2b^2}{a-b}, \frac{a^2 - b^2}{a-b} = a^2 - a^2 + a^2 - b^2 + b^2 - b^2$$

$$\frac{a^2 - b^2}{a-b} = a^2 - a^2 + a^2 - b^2 + b^2 - b^2 = a^2 - b^2$$

$$\frac{a^2 - b^2}{a-b} = a+b + \frac{2b^2}{a-b}, \frac{a^2 - b^2}{a-b} = a^2 - a^2 + a^2 - b^2 + b^2 - b^2$$

$$\frac{a^2 - b^2}{a-b} = a^2 - a^2 + a^2 - b^2 + b^2 - b^2 = a^2 - b^2$$

$$(a+b)^2 = a^2 + 2ab + b^2; (a-b)^2 = a^2 - 2ab + b^2$$

$$(a+b)^2 = a^2 + 2ab + b^2; (a-b)^2 = a^2 - 2ab + b^2$$

$$1+2+3 = (1+2+3), 1+2+3+4 = (1+2+3+4)$$

$$1+2+3+4+5+6+7+8 = (1+2+3+4+5+6+7+8)$$

$$1+2+3+4+5+6+\dots+n = (1+2+3+4+5+\dots+n)$$

(9)

(1)

एकवर्णसमीकरणें

(1) $3x + 4x = 99 + 4$

$$7x = 103 \therefore x = \frac{103}{7} = 14.71$$

(2) $99x - 4x = 209 - 9$

$$95x = 200 \therefore x = \frac{200}{95} = 2.10$$

(3) $7x = 900 - 3x$

$$7x + 3x = 900$$

$$10x = 900 \therefore x = 90$$

(4) $13x = 44 + 4x$

$$13x - 4x = 44$$

$$9x = 44 \therefore x = 4.88$$

(5) $3x + 84 = 6x$

$$3x - 6x = -84$$

$$-3x = -84$$

$$\therefore 3x = 84 \therefore x = 28$$

(6) $4x - 90 = 92 + 2x$

$$4x - 2x = 92 + 90$$

$$2x = 182 \therefore x = 91$$

(7) $8x + 40 = 6x + 9$

$$8x - 6x = 9 - 40$$

$$2x = -31 \therefore x = -15.5$$

(8) $3x + 4x = 25 + 12x$

$$7x = 25 + 12x$$

$$7x - 12x = 25$$

$$-5x = 25 \therefore x = -5$$

(9) $3x + 4x + 94 = 92x + 4$

$$7x - 92x = 4 - 94$$

(10) $-4x + 8x - 3 = 2x - 9$

$$4x - 3 = 2x - 9$$

(२)

$$(अ) \quad 8x^2 + 4x = 20 + 4x^2 \quad x + 2x = 4 - 2 = 2$$
$$\therefore 4x = 20 \therefore x = \frac{20}{4} = 5 \quad 3x = 2 \therefore x = \frac{2}{3}$$

$$(99) \quad 6x + 9x - 4x + 36 = 8x + 48 \quad (92) \quad 4x^2 - 12x - 2x^2 = (2x + 1) = 16 - 2x^2$$
$$92x + 36 = 8x + 48 \therefore 92x - 8x = 48 - 36 \quad 4x^2 - 12x - 4x^2 - 2x^2 = 16 - 2x^2$$
$$3x = 12 \therefore x = \frac{12}{3} = 4 \quad \therefore -12x = 16 \therefore x = -\frac{4}{3}$$

$$(97) \quad 3x - 4x^2 + 6x - 4x + 8x^2 = 120$$
$$\therefore 3x + 6x - 4x = 120 \therefore 9x - 4x = 120 \therefore 8x = 120 \therefore x = 30$$

$$(ब) \quad 8x + 9x - 4x + 36 = 8x - 48 + 99x$$
$$6x + 36 = 20x - 48 \therefore 92x = 84 \therefore x = 9$$

$$(98) \quad 6x + 15 - 3x + 11 + 9x - 6 = 12x + 45 - 9x + 4$$
$$6x - 3x + 9x - 12x + 9x = 45 + 4 - 15 - 11 + 6$$
$$9x = 22 \therefore x = \frac{22}{9} = 2 \therefore x = 2 \text{ हैं उत्तर}$$

$$(99) \quad 3x + 12 - 4x + 10 = 9x - 10 + 16x - 32$$
$$3x - 4x - 9x - 16x = -10 - 32 - 12 - 10$$
$$-26x = -64 \therefore 26x = 64 \therefore x = \frac{32}{13}$$

(3)

$$(16) 3x + 4 + 9x + 6 = 4x + 15 + 9x + 6$$

$$\therefore 3x + 4 + 6 = 4x + 15 + 6 \therefore -2x = 12 \therefore x = -6$$

$$(17) 9x + 28 - 6x + 6 = 11x - 6 + 10x + 28$$

$$\therefore 9x - 6x + 6 = 11x - 6 + 10x \therefore 9x + 6 = 11x - 6 + 10x$$

$$\therefore 6 = 11x - 6 \therefore 11x = 12 \therefore x = \frac{12}{11} = 1 \frac{1}{11}$$

$$(18) ax + k - bx - m = nx + b - sx - d$$

$$ax - bx - nx + sx = b - d - k + m$$

$$\therefore x(ax - b - n + s) = b + m - d - k \therefore x = \frac{b + m - (d + k)}{ax - (b + n)}$$

$$(19) 4x + 15 - 6x + 7 = 9 + 12x - 6x + 18 + 4x$$

$$15 + 7 = 9 + 12x + 18 \therefore 12x = 22 - 23 \therefore x = \frac{-1}{12}$$

$$(20) 3x^2 + 85 - 9x + 10x^2 = 2x^2 - 99 + 8x^2 + x^2 + 3x^2$$

$$\therefore 3x^2 + 85 - 9x + 10x^2 = 3x^2 - 99 + 10x^2$$

$$\therefore 85 - 9x = -99 \therefore 9x = 85 + 99 \therefore x = 9 + 9 \frac{5}{9} = 18 \frac{5}{9}$$

$$(21) 3x + \frac{3}{4} = 4x - \frac{1}{4}$$

$$(22) 10x - \frac{6}{5} = 3x + \frac{5}{5}$$

$$\therefore 3x - 4x = -\frac{9}{8} - \frac{3}{8}$$

$$-x = -1 \therefore x = \frac{9}{2}$$

$$7x - 3x = \frac{9}{2} + \frac{16}{2}$$

$$4x = \frac{25}{2} \therefore x = \frac{25}{32} = \frac{9}{2}$$

$$(23) \quad 4x + \frac{3}{5} = 3x + \frac{6}{8}$$

$$4x - 3x = \frac{6}{8} - \frac{3}{5}$$

$$x = \frac{35 - 24}{40} \therefore x = \frac{11}{40}$$

$$(24) \quad \frac{4x}{5} + 9 = \frac{3x}{8} + 10$$

$$\frac{4x}{5} - \frac{3x}{8} = 10 - 9$$

$$\frac{32x}{40} - \frac{15x}{40} = 1 \therefore \frac{17x}{40} = 1$$

$$\therefore x = \frac{40}{17} = 900$$

$$(25) \quad \frac{x}{2} + \frac{x}{3} + \frac{x}{8} = 39$$

$$\frac{12x}{24} + \frac{8x}{24} + \frac{3x}{24} = 39 \times 24$$

$$13x + 8x + 3x = 936$$

$$\therefore 24x = 936 \therefore x = 39$$

$$(26) \quad \frac{3x}{8} + \frac{4x}{5} = \frac{8x}{9} - 10$$

$$\frac{27x}{72} + \frac{64x}{72} = \frac{64x}{72} - 720$$

$$27x + 64x = 64x - 720$$

$$27x = -720 \therefore x = -\frac{720}{27}$$

$$(27) \quad \frac{3x}{5} + \frac{4x}{6} = \frac{3x}{8} + 9$$

$$3x + \frac{20x}{6} = \frac{15x}{8} + 72$$

$$24x + 20x = \frac{15x}{8} + 720$$

$$44x + 20x = 15x + 720$$

$$(28) \quad \frac{4x}{5} + \frac{3x}{2} - \frac{6x}{9} = \frac{11}{12}$$

$$\frac{4x}{5} + \frac{3x}{2} - \frac{2x}{3} = \frac{11}{12}$$

$$\frac{24x}{60} + \frac{45x}{60} - \frac{40x}{60} = \frac{11}{12}$$

(५)

$$55\text{क्ष} = 92\text{क्ष} \therefore \text{क्ष} = \frac{92\text{क्ष}}{55}$$

$$\frac{20\text{क्ष}}{12} - \frac{1\text{क्ष}}{5} = \frac{99}{8}$$

(क) $\frac{3\text{क्ष}}{5} - 8 + 3\text{क्ष} = 4 + 3\text{क्ष}$

$$\therefore -8 + 3\text{क्ष} = 4 + 3\text{क्ष} - 3\text{क्ष} = 12$$

$$\therefore \text{क्ष} = 8$$

$$\frac{18\text{क्ष}}{60} - \frac{4\text{क्ष}}{60} = \frac{99}{6} \therefore \frac{14\text{क्ष}}{60} = \frac{99}{6}$$

$$\therefore \text{क्ष} = \frac{99}{6} \times \frac{60}{14} = \frac{990}{14}$$

(२९) $\frac{3\text{क्ष}}{6} - 5\frac{9}{3} + \frac{2\frac{3}{8}\text{क्ष}}{5} = \frac{3\frac{3}{4}\text{क्ष}}{5} + 12\frac{1}{8} + 3\text{क्ष}$

$$\frac{3\text{क्ष}}{6} - \frac{9\text{क्ष}}{3} + \frac{2\text{क्ष}}{20} = \frac{3\text{क्ष}}{20} + \frac{8\text{क्ष}}{8} + 3\text{क्ष}$$

$$\frac{3\text{क्ष}}{6} + \frac{2\text{क्ष}}{20} - \frac{9\text{क्ष}}{20} - 3\text{क्ष} = \frac{8\text{क्ष}}{8} + \frac{9\text{क्ष}}{3} \therefore \frac{3\text{क्ष}}{6} - \frac{7\text{क्ष}}{20} - 3\text{क्ष} = 10\frac{6}{12}$$

$$\therefore \frac{3\text{क्ष}}{6} - \frac{7\text{क्ष}}{20} - 3\text{क्ष} = 10\frac{6}{12} \therefore \frac{3\text{क्ष}}{6} - \frac{7\text{क्ष}}{20} = \frac{6}{12}$$

$$\frac{9\text{क्ष} - 7\text{क्ष}}{20} = 10\frac{6}{12} \therefore \frac{-2\text{क्ष}}{20} = 10\frac{6}{12} \therefore \text{क्ष} = \frac{-10\frac{6}{12} \times 20}{2} = -\frac{110}{1}$$

(३०) $\frac{\text{क्ष}-5}{8} + 6\text{क्ष} = \frac{208-\text{क्ष}}{5}$

$$\frac{\text{क्ष}-5}{8} + 6\text{क्ष} = \frac{208-\text{क्ष}}{5}$$

$$\frac{\text{क्ष}}{8} + 6\text{क्ष} + \frac{\text{क्ष}}{5} = \frac{208}{5} + \frac{5}{5}$$

$$\frac{9\text{क्ष}}{20} + 6\text{क्ष} = \frac{213}{5} + 1\frac{1}{8}$$

(३१) $\frac{3\text{क्ष}+5}{6} + \frac{8\text{क्ष}-2}{8} = 5$

$$\frac{3\text{क्ष}}{6} + \frac{5}{6} + \frac{8\text{क्ष}}{8} - \frac{2}{8} = 5$$

$$\frac{\text{क्ष}}{2} + \text{क्ष} = 5 - \frac{5}{6} + \frac{1}{4}$$

$$\text{क्ष} \left(\frac{1}{2} + 1 \right) = 8\frac{1}{4} + \frac{1}{4} = 8\frac{2}{4}$$

(६)

$$\frac{6}{20} \text{क्ष} = \frac{6}{10} \frac{\text{क्ष}}{2} + \frac{1}{10}$$

$$\therefore \text{क्ष} = \frac{\frac{6}{10} \frac{\text{क्ष}}{2} + \frac{1}{10}}{\frac{6}{20}} = 1$$

$$\text{क्ष} = \frac{8}{\frac{1}{2} + \frac{1}{3}} = \frac{8}{\frac{3}{2} + \frac{2}{3}} = \frac{24}{5} = 4 \frac{4}{5}$$

$$\therefore \text{क्ष} = \frac{24}{5} \times \frac{2}{3} = \frac{16}{5} = 3 \frac{1}{5}$$

(३२) $\frac{\text{क्ष} + \frac{8}{9}}{\frac{1}{6} + \frac{1}{3}} + \frac{3\text{क्ष} - \frac{5}{3}}{\frac{3}{8} + \frac{1}{2}} = \frac{8\text{क्ष} - \frac{6}{3}}{\frac{8}{12} + \frac{6}{12}} + \frac{3}{6}$

$$\frac{\text{क्ष}}{\frac{1}{6}} + \frac{8}{\frac{1}{3}} + \frac{3\text{क्ष}}{\frac{3}{8}} - \frac{5}{\frac{1}{2}} = \frac{8\text{क्ष}}{\frac{8}{12} + \frac{6}{12}} + \frac{3}{6}$$

$$\frac{3\text{क्ष}}{22} + \frac{24}{11} + \frac{92\text{क्ष}}{96} - \frac{10}{12} = \frac{20\text{क्ष}}{28} - \frac{100}{96} + \frac{25}{6}$$

$$\frac{3\text{क्ष}}{22} + \frac{8\text{क्ष}}{3} - \frac{5\text{क्ष}}{3} = \frac{100}{62} + \frac{25}{6} - \frac{10}{11} + \frac{10}{84}$$

$$\text{क्ष} \left(\frac{3}{22} + \frac{8}{3} - \frac{5}{3} \right) = \frac{100}{62} + \frac{25}{6} - \frac{10}{11} + \frac{10}{84}$$

$$\text{क्ष} = \frac{\frac{100}{62} + \frac{25}{6} - \frac{10}{11} + \frac{10}{84}}{\frac{3}{22} + \frac{8}{3} - \frac{5}{3}} =$$

(३३) $\frac{3\text{क्ष}}{\text{अ}} + \frac{\text{क्ष}}{\text{अ}} = \text{न}$

$$\therefore \frac{3\text{क्ष} + \text{क्ष}}{\text{अ}} = \text{न}$$

(३४) $\frac{\text{अक्ष}}{3\text{अ}} - \frac{5\text{नक्ष}}{2\text{ब}} = \text{क}$

$$\text{क्ष} \left(\frac{1}{3\text{अ}} - \frac{5\text{न}}{2\text{ब}} \right) = \text{क}$$

(19)

$$3वक्ष + कक्ष = अन$$

$$क्ष(3व+क) = अन$$

$$क्ष = \frac{अन}{3व+क}$$

$$क्ष = \frac{क}{\frac{8अ}{3म} - \frac{5न}{2व}}$$

$$(35) 92-क्ष = \frac{क्ष}{2} :: 8:9$$

$$92-क्ष = 2क्ष :: क्ष = 8$$

$$(36) 4क्ष+8:3क्ष-2::4:5$$

$$30क्ष+28 = 28क्ष-9क्ष$$

$$6क्ष = -80 :: क्ष = -\frac{80}{3}$$

$$(37) \frac{4क्ष+8}{2} : \frac{9क्ष-2}{2} :: 7:8$$

$$90क्ष+4 = \frac{92क्ष-10क्ष}{2}$$

$$20क्ष+9क्ष = 92क्ष-10क्ष$$

$$29क्ष = 990 :: क्ष = \frac{990}{29}$$

$$(38) \frac{3क्ष-5}{क्ष-6} : \frac{6क्ष-6}{4क्ष+9} :: 5:2$$

$$\frac{6क्ष-90}{क्ष-6} = \frac{30क्ष-45}{4क्ष+9}$$

$$\frac{6क्ष-84+36}{क्ष-6} = \frac{30क्ष+48-48}{4क्ष+9}$$

$$\frac{6क्ष-48}{क्ष-6} + \frac{36}{क्ष-6} = \frac{30क्ष+48-48}{4क्ष+9}$$

$$\frac{6}{क्ष-6} + \frac{36}{क्ष-6} = \frac{30}{4क्ष+9} + \frac{48}{4क्ष+9} = \frac{78}{4क्ष+9}$$

$$(39) अक्ष+व:कक्ष+म:न:ड$$

$$अडक्ष+बड=कनक्ष+मन$$

$$अडक्ष-कनक्ष=मन-बड$$

$$क्ष(अड-कन)=मन-बड$$

$$\therefore \frac{99}{क्ष-6} = \frac{48}{4क्ष+9} :: 99(4क्ष+9) = 48(क्ष-6)$$

$$99क्ष+1109 = 48क्ष+306$$

(C)

$$\text{क्ष} = \frac{\text{मन-वड}}{\text{अव-कन}}$$

$$\therefore 182\text{क्ष} = 195 \therefore \text{क्ष} = \frac{195}{182}$$

$$(80) 3\text{क्ष} + 5 = 5\text{क्ष} - 3\text{क्ष} \therefore 3 : 5$$

$$(82) 3\text{क्ष} - 5\text{क्ष} = 5\text{क्ष} + 7\text{क्ष} \therefore 1 : 5$$

$$15\text{क्ष} + 25 = 15\text{क्ष} - 5\text{क्ष}$$

$$15\text{क्ष} - 25\text{क्ष} = 15\text{क्ष} + 35\text{क्ष}$$

$$\therefore 25 = -5\text{क्ष} \therefore \text{क्ष} = -\frac{5}{5}$$

$$-25\text{क्ष} = -35 \therefore \text{क्ष} = \frac{35}{25} = \frac{7}{5}$$

$$(89) 7\text{क्ष} + 5\text{क्ष} = 5\text{क्ष} + 6 \therefore 7 : 5$$

$$\text{क्ष} = \sqrt{\frac{6}{5}}$$

$$15\text{क्ष} + 25\text{क्ष} = 15\text{क्ष} + 42$$

$$(83) 8\text{क्ष} + 3\text{क्ष} = 7\text{क्ष} \therefore 2 : 8 : 7$$

$$25\text{क्ष} = 42 \therefore \text{क्ष} = \frac{42}{25}$$

$$2\text{क्ष} + 7\text{अक्ष} = 2\text{क्ष} - 6$$

$$7\text{अक्ष} = -6 \therefore \text{क्ष} = \frac{-6}{7\text{अ}}$$

$$(88) 5\text{क्ष} + 3 = 15 \therefore \text{क्ष} - 8\text{क्ष} = 3\text{क्ष} - 6$$

$$\therefore (5\text{क्ष} + 3)(3\text{क्ष} - 6) = 15(\text{क्ष} - 8\text{क्ष}) 8\text{क्ष}$$

$$15\text{क्ष} - 31\text{क्ष} - 28 = 15\text{क्ष} - 60\text{क्ष}$$

$$-31\text{क्ष} - 28 = 60\text{क्ष} \therefore 29\text{क्ष} = 28 \therefore \text{क्ष} = \frac{28}{29}$$

$$(85) 6\text{क्ष} + 5 = 7\text{क्ष} - 5 \therefore \frac{12\text{क्ष} - 5}{3} : 8\frac{2}{3}\text{क्ष} + 10$$

$$= (6\text{क्ष} + 5)(8\frac{2}{3}\text{क्ष} - 10) = (7\text{क्ष} - 5)(\frac{12\text{क्ष} - 5}{3})$$

$$\frac{(6\text{क्ष} + 5)(12\text{क्ष} - 10)}{3} = \frac{(7\text{क्ष} - 5)(12\text{क्ष} - 5)}{3}$$

$$\therefore -9 \pm \sqrt{81} = -9 \pm 9 = -9 + 9 = 0 \text{ or } -9 - 9 = -18$$

$$(46) \sqrt{3x+8} = 4$$

$$\text{वर्गकरूल } 3x+8=16$$

$$\therefore 3x=12 \therefore x=4$$

$$(47) \sqrt{12+x}+8=6$$

$$\sqrt{12+x}=6-8=8$$

$$\text{वर्गकरूल } 12+x=64 \therefore x=52$$

$$(48) \sqrt{5+2x}-9=7$$

$$\therefore \sqrt{5+2x}=16$$

$$\text{वर्गकरूल } 5+2x=256$$

$$\therefore 2x=251 \therefore x=125.5$$

$$(49) 8\sqrt{5+x}=3$$

$$\therefore \sqrt{5+x} = \frac{3}{8} \text{ वर्गकरावा}$$

$$5+x = \frac{9}{64} \therefore x = -4\frac{55}{64}$$

$$(50) \sqrt[3]{2+x}=3$$

$$\text{घनकरूल } 2+x=27 \therefore x=25$$

$$x=25$$

$$(51) 3\sqrt[3]{5+x}=8$$

$$\therefore \sqrt[3]{5+x} = \frac{8}{3}$$

$$5+x = \left(\frac{8}{3}\right)^3 = \frac{512}{27}$$

$$x = \frac{512}{27} - 5 = -1\frac{13}{27}$$

$$(52) \sqrt{9+3x} = 3-x$$

$$9+3x = 9-6x+x^2$$

$$\therefore 3x = -6x+x^2$$

$$3 = -6+x$$

$$\therefore x=9$$

$$(53) \sqrt{3+4x+4x^2} = 2-2x$$

$$3+4x+4x^2 = 4-8x+4x^2$$

$$3+4x = 4-8x \therefore 12x = 1$$

$$\therefore x = \frac{1}{12}$$

(92)

$$(66) \quad \text{क्ष} = \sqrt{\text{अ} + \text{क्ष}} \sqrt{\text{ब} + \text{क्ष}} - \text{अ}$$

$$\therefore \text{अ} + 2\text{अक्ष} + \text{क्ष}^2 = \text{अ} + \text{क्ष} \sqrt{\text{ब} + \text{क्ष}} \therefore 2\text{अक्ष} + \text{क्ष}^2 = \text{क्ष} \sqrt{\text{ब} + \text{क्ष}}$$

$$\therefore 2\text{अ} + \text{क्ष} = \sqrt{\text{ब} + \text{क्ष}} \therefore 4\text{अ} + 4\text{अक्ष} + \text{क्ष}^2 = \text{ब} + \text{क्ष}$$

$$\therefore 4\text{अ} + 4\text{अक्ष} = \text{ब} \therefore 4\text{अक्ष} = \text{ब} - 4\text{अ} \therefore \text{क्ष} = \frac{\text{ब} - 4\text{अ}}{4\text{अ}}$$

$$(67) \quad \sqrt{\text{क्ष} + \sqrt{\text{क्ष}}} - \sqrt{\text{क्ष} - \sqrt{\text{क्ष}}} = \frac{3}{2} \cdot \sqrt{\frac{\text{क्ष}}{\text{क्ष} + \sqrt{\text{क्ष}}}}$$

$$\text{छेदसोडऊन } \text{क्ष} + \sqrt{\text{क्ष}} - \sqrt{\text{क्ष} - \text{क्ष}} = \frac{3}{2} \cdot \sqrt{\text{क्ष}}$$

$$\therefore \sqrt{\text{क्ष} - \text{क्ष}} = \text{क्ष} - \frac{3}{2} \sqrt{\text{क्ष}} \therefore \text{क्ष} - \text{क्ष} = \text{क्ष} - \text{क्ष} \sqrt{\text{क्ष}} + \frac{3}{2} \sqrt{\text{क्ष}}$$

$$\therefore -\text{क्ष} = -\text{क्ष} \sqrt{\text{क्ष}} + \frac{3}{2} \sqrt{\text{क्ष}} \therefore \text{क्ष} \sqrt{\text{क्ष}} = \frac{3}{2} \sqrt{\text{क्ष}} \therefore \sqrt{\text{क्ष}} = \frac{3}{2}$$

$$(68) \quad \sqrt{4 + \text{क्ष}} + \sqrt{\text{क्ष}} = \frac{\sqrt{3 + \sqrt{\text{क्ष}}} + 2\sqrt{10\frac{2}{3} - 6\sqrt{\text{क्ष}}}}{\sqrt{4 + \text{क्ष}} - \sqrt{\text{क्ष}}}$$

$$\therefore 4 + \text{क्ष} - \text{क्ष} = \sqrt{3 + \sqrt{\text{क्ष}}} + 2\sqrt{10\frac{2}{3} - 6\sqrt{\text{क्ष}}}$$

$$\therefore 4 - \sqrt{3 + \sqrt{\text{क्ष}}} = 2\sqrt{10\frac{2}{3} - 6\sqrt{\text{क्ष}}}$$

$$25 - 90\sqrt{3 + \sqrt{\text{क्ष}}} + 3 + \sqrt{\text{क्ष}} = 90 - 24\sqrt{\text{क्ष}}$$

$$\therefore -90\sqrt{3 + \sqrt{\text{क्ष}}} = 2 - 24\sqrt{\text{क्ष}} \therefore 2\sqrt{3 + \sqrt{\text{क्ष}}} = 4\sqrt{\text{क्ष}} + \frac{2}{3}$$

$$\therefore 92 + 8\sqrt{\text{क्ष}} = 24\text{क्ष} + 4\sqrt{\text{क्ष}} + \frac{4}{3}$$

$$\therefore 92 = 24\text{क्ष} + \frac{4}{3} \therefore \text{क्ष} = \frac{92 - \frac{4}{3}}{24}$$

$$(9) \frac{x+9}{5} + 3 = \frac{2x-3}{3}$$

$$(90) \frac{2x-4}{90} + \frac{9x-x}{3} = \frac{90x-9}{5} - \frac{4}{2}$$

$$(2) \frac{8x-4}{5} - \frac{8}{5} = \frac{8x}{3}$$

$$(99) \frac{3x+4}{6} + 4x = 39 + \frac{21+x}{3}$$

$$(3) \frac{7x+2}{3} + 4x = 24 + \frac{4x-6}{9} \quad (92) \frac{98x+4}{6} + \frac{3x-2}{5} = \frac{4+9x}{8}$$

$$(8) \frac{c-x-4}{14} - \frac{8x}{9} = 3 - \frac{4x+3}{5}$$

$$(93) x - \frac{2x+9}{3} = \frac{x+3}{8}$$

$$(4) \frac{3x}{8} + \frac{4-6x}{6} + 2x = 8 - \frac{9}{8}$$

$$(94) \frac{8x - \frac{c+2x}{3}}{3} = 39 - 4x$$

$$(6) \frac{8x-4}{6} - 3 - \frac{9}{5} = \frac{2x}{3} + 4 - x$$

$$(95) \frac{29-3x}{3} - \frac{8x+6}{9} = \frac{4}{5} - \frac{4x+4}{8}$$

$$(7) -(x+2)(x-3) = 5 - 2x + 8 \quad (96) \frac{3x}{3} + \frac{3x}{8} = 3x - 8$$

$$(5) \frac{3x+8}{5} + 2x = \frac{2x-x}{5} + 14$$

$$(97) \frac{8x+3x}{8} + \frac{3x-4x}{6} = \frac{3+2x}{6}$$

$$(9) \frac{7-x}{2} + 8 = \frac{3x-19}{8} + \frac{c-x+14}{5}$$

$$(98) \frac{3x+9}{8x-4} + \frac{3}{8} = \frac{4+2x}{c-x-10}$$

(2)

$$(19) \frac{6x+6}{19} - \frac{4x+3}{2} = \frac{20-8x}{3} - \frac{3x+9}{2}$$

$$(20) \frac{0x-13\frac{1}{2}}{19} - \frac{2}{3} \cdot \frac{x-19}{9} = \frac{9x}{98} (x-1)$$

$$(21) 4x + \frac{0x+9}{8x+3} = 9 + \frac{10x^2-10}{2x+3}$$

$$(22) \frac{0x+6}{20} + \frac{x-3}{42} + \frac{x}{8} = \frac{19x}{29} + \frac{2x+8\frac{2}{3}}{23x-6}$$

$$(23) \frac{6-4x}{19} - \frac{0-2x^2}{98(x-1)} = \frac{1+3x}{29} - \frac{2x-1\frac{1}{2}}{6} + \frac{1}{905}$$

$$(24) \frac{9x+20}{36} = \frac{8x-12}{4x-4} + \frac{x}{8}$$

$$(25) \frac{20x+36}{25} + \frac{4x+20}{9x-16} = \frac{8x}{15} + \frac{40}{25}$$

$$(26) \frac{10x-18}{20} + \frac{99x+29}{6x+18} = \frac{9x+99}{98}$$

$$(27) \frac{2x+0\frac{1}{2}}{9} - \frac{99x-2}{90x-32} + \frac{x}{9} = \frac{0x}{12} - \frac{x+16}{36}$$

$$(28) 29 + \frac{3x-11}{96} = \frac{4x-4}{8} + \frac{96-6x}{2}$$

$$(29) \frac{29-3x}{3} - \frac{4x+6}{8} = \frac{4x+9}{8}$$

$$(30) \frac{4x-29}{8} + \frac{3}{8} + \frac{96-3x}{8} = \frac{289-4x-6x}{92} - 99x$$

$$(31) \frac{x}{2} - \frac{\frac{2x-3}{3} - \frac{3x-9}{8}}{\frac{x-9}{2}} = \frac{3}{2} \left(\frac{x+2}{3x-2} \right)$$

$$(32) \frac{94x+6}{3x+9} + \frac{20x-92}{4x-2} = \frac{903-6x}{93-x}$$

$$(33) 4x+9 : 3x+10 :: 93 : 96$$

$$(34) \frac{90+x}{4} : \frac{4x-5}{6} :: 98 : 4$$

$$(35) \frac{96-4x}{8} : \frac{94+2x}{3} - 2x : 4 : 8$$

$$(36) 96x+6 : \frac{4x+98}{9x+39} : 36x+90 : 9$$

(४)

$$(२७) \frac{४क्ष+३}{६क्ष+४} : १ :: २क्ष+१९ : ३क्ष-१९$$

$$(३८) अ+क्ष : अ-क्ष : ब : क$$

$$(३९) ३क्ष+५क्ष-६ : ४क्ष-८क्ष+७ :: २१ : २८$$

$$(४०) \frac{३}{२} क्ष + \frac{५}{३} क्ष - \frac{५}{६} : \frac{४}{५} क्ष - \frac{३}{६} क्ष + \frac{४}{६} :: १५ : ८$$

$$(४१) \sqrt{क्ष} + \sqrt{क्ष-९} = \frac{३क्ष}{\sqrt{क्ष-९}}$$

$$(४२) \sqrt{१+क्ष} \sqrt{क्ष+१} = १+क्ष$$

$$(४३) \frac{अ}{\sqrt{अ+क्ष}-क्ष} = ब :: \sqrt{अ+क्ष}-क्ष = \frac{अ}{ब}$$

$$(४४) \frac{\sqrt{अ}-\sqrt{अ-क्ष}}{\sqrt{अ}+\sqrt{अ-क्ष}} = अ$$

$$(४५) \frac{अ+क्ष+\sqrt{२अक्ष+क्ष^२}}{अ+क्ष-\sqrt{२अक्ष+क्ष^२}} = ब$$

$$(४६) १२-क्ष : क्ष :: ४ : १ :: १२-क्ष = २क्ष : क्ष = ४$$

$$(४७) ५क्ष+४ : ३क्ष-२ :: ६ : ३ :: ३०क्ष+२४ = २४क्ष-१६ : क्ष = \frac{१६}{३}$$

(१)

मागे सोड विण्याकरिता दिलेली एक वर्ण समीकरणे येथे सोडविली आहेत.

$$(१) \frac{x+9}{5} + 7 = \frac{2x-3}{3}$$

$$3x+9+35 = 10x-15$$

$$\therefore 6x = 63 \therefore x = 9$$

$$\frac{5x}{15} + \frac{105}{15} = \frac{2x}{3} + \frac{9}{3}$$

$$\frac{5x+105}{15} = \frac{2x+9}{3}$$

$$5x+105 = 10x+45$$

$$105-45 = 10x-5x$$

$$60 = 5x$$

$$x = \frac{60}{5} = 12$$

$$(२) \frac{8x-5}{5} - \frac{8}{5} = \frac{8x}{3}$$

$$20x-25-24 = 80x$$

$$\therefore 20x = 89 \therefore x = \frac{89}{20}$$

$$\frac{80x-40}{100} - \frac{16}{100} = \frac{80x}{300}$$

$$\frac{80x-56}{100} = \frac{80x}{300}$$

$$3(80x-56) = 80x$$

$$240x-168 = 80x$$

$$160x = 168$$

$$x = \frac{168}{160} = \frac{21}{20}$$

$$(३) \frac{6x+2}{3} + 5x = 2 + \frac{4x}{6}$$

$$\frac{6x+2+15x}{3} = \frac{4x+12}{6}$$

$$15x+18 = 4x+12$$

$$15x-4x = 12-18$$

$$11x = -6$$

$$\therefore x = \frac{-6}{11}$$

$$\frac{3x}{8} + \frac{5-4x}{6} + 2x = 8\frac{1}{8}$$

$$\frac{3x}{8} + \frac{5}{6} - \frac{4x}{6} + 2x = 8\frac{1}{8}$$

$$\frac{3x}{8} + \frac{5}{6} - \frac{2x}{3} + 2x = 8\frac{1}{8}$$

$$\frac{3x}{8} - \frac{2x}{3} + 2x = 8\frac{1}{8} - \frac{5}{6}$$

$$\frac{9x-16x+48x}{24} = \frac{63-10}{8}$$

$$\frac{41x}{24} = \frac{53}{8}$$

$$41x = 159$$

$$x = \frac{159}{41} = 3\frac{36}{41}$$

$$\therefore 11x = -6 \therefore x = \frac{-6}{11}$$

$$\frac{3x}{8} + \frac{5}{6} - \frac{2x}{3} + 2x = 8\frac{1}{8}$$

$$\frac{3x}{8} - \frac{2x}{3} + 2x = 8\frac{1}{8} - \frac{5}{6}$$

$$\frac{9x-16x+48x}{24} = \frac{63-10}{8}$$

$$\frac{41x}{24} = \frac{53}{8}$$

$$41x = 159$$

$$x = \frac{159}{41} = 3\frac{36}{41}$$

$$(४) \frac{5x-5}{15} - \frac{8x}{6} = 3 - \frac{9x+3}{5}$$

$$\therefore \frac{5x-5}{15} - \frac{8x}{6} = 3 - \frac{9x+3}{5}$$

$$\frac{5x-5}{15} + \frac{9x+3}{5} = 3 + \frac{8x}{6}$$

$$\frac{5x-5+27x+9}{15} = 3 + \frac{8x}{6}$$

$$\frac{32x+4}{15} = 3 + \frac{8x}{6}$$

$$\frac{32x+4}{15} - \frac{8x}{6} = 3$$

$$\frac{32x+4-20x-20}{30} = 3$$

$$\frac{12x-16}{30} = 3$$

$$12x-16 = 90$$

$$12x = 106$$

$$x = \frac{106}{12} = 8\frac{23}{6}$$

$$(५) \frac{8x-5}{5} + 3 = \frac{2x}{5} + 4-x$$

$$\frac{8x-5}{5} - \frac{2x}{5} + 3 = 4-x$$

$$\frac{6x-5}{5} + 3 = 4-x$$

$$\frac{6x-5}{5} + \frac{15}{5} = 4-x$$

$$\frac{6x+10}{5} = 4-x$$

$$6x+10 = 20-5x$$

$$6x+5x = 20-10$$

$$11x = 10$$

$$x = \frac{10}{11}$$

(2)

$$(9) \begin{aligned} (x+2)(x-3) &= x^2 - x + 4 \quad (6) \quad \frac{3x+4}{5} + 2x = \frac{22-x}{5} + 9 \\ \therefore x^2 - x - 6 &= x^2 - x + 4 \\ \therefore -6 &= 10 \quad \therefore x = 9 \frac{9}{8} \end{aligned}$$

$$\begin{aligned} \frac{3x+4}{5} + 2x &= \frac{22-x}{5} + 9 \\ \frac{3x+4}{5} + \frac{10x}{5} &= \frac{22-x}{5} + \frac{45}{5} \\ \therefore 3x+4+10x &= 22-x+45 \\ \therefore 13x &= 41 \quad \therefore x = \frac{41}{13} \end{aligned}$$

$$(10) \begin{aligned} \frac{10-x}{2} + 8 &= \frac{3x-11}{8} + \frac{6x+19}{5} \quad (90) \quad \frac{2x-4}{9} + \frac{19-x}{3} = \frac{10x-6}{9} - \frac{4}{2} \\ \therefore \frac{40-6x}{2} + \frac{64}{2} &= \frac{3x-11}{8} + \frac{36x+76}{20} \quad \frac{x}{5} - \frac{4}{9} + \frac{19}{3} = \frac{10x}{9} - \frac{6}{9} - \frac{4}{2} \\ \frac{40-6x+64}{2} &= \frac{3x-11}{8} + \frac{36x+76}{20} \quad \frac{x}{5} - \frac{4}{9} + \frac{19}{3} = \frac{10x-6-12}{9} \\ \frac{104-6x}{2} &= \frac{3x-11}{8} + \frac{36x+76}{20} \quad \frac{x}{5} - \frac{4}{9} + \frac{19}{3} = \frac{10x-18}{9} \\ 104-6x+80 &= 3x-11+18x+38 \\ 184-6x &= 21x+27 \\ 184-27 &= 21x+6x \\ \therefore 157 &= 27x \\ \therefore x &= \frac{157}{27} \\ x-3 & \end{aligned}$$

$$(99) \begin{aligned} \frac{3x+4}{2} + 4x &= 3x + \frac{21+x}{3} \quad (92) \quad \frac{14x+4}{2} + \frac{3x-2}{5} = \frac{4+6x}{8} \\ \therefore 3x+4+8x &= 3x + \frac{21+x}{3} \\ 11x+4 &= 3x + \frac{21+x}{3} \\ 11x+4 &= 3x + 7 + \frac{x}{3} \\ 11x-3x &= 7 + \frac{x}{3} - 4 \\ 8x &= 3 + \frac{x}{3} \\ 24x &= 9 + x \\ 23x &= 9 \quad \therefore x = \frac{9}{23} \end{aligned}$$

(92)

$$\frac{3x-5}{5} = \frac{5}{8} \Rightarrow 3x-5 = \frac{25}{8}$$

$$\frac{3x-5}{5} = \frac{25}{8} \Rightarrow 3x-5 = \frac{25}{8}$$

$$(93) \frac{2x+1}{3} = \frac{5x+3}{8}$$

$$12x - 6x - 8 = 15x + 9$$

$$6x - 8 = 15x + 9$$

$$x = 9 + 8 \therefore x = 17$$

$$\therefore x = 17$$

$$(94) \frac{29-3x}{3} = \frac{4x+6}{9} = \frac{5x+1}{8}$$

$$3-4x = \frac{4x+6}{3} = \frac{5x+1}{8}$$

$$24-32x = 12x+24 = 15x+1$$

$$24-32x = 12x+24 = 15x+1$$

$$24+1 = 15x+24$$

$$25 = 15x+24$$

$$\therefore 1 = 15x \therefore x = \frac{1}{15}$$

$$(95) \frac{4x-5+2x}{3} = 39-4x$$

$$6x-5 = 117-12x$$

$$18x-5 = 117$$

$$18x = 122 \therefore x = \frac{122}{18}$$

$$x = \frac{61}{9}$$

$$(96) \frac{a}{3} + \frac{3b}{4} = 3m-8$$

$$4a+9b = 36m-32$$

$$4a+9b-36m = -32$$

$$\therefore x = \frac{-32}{4a+9b-36m}$$

$$(97) \frac{4a+3b}{8} + \frac{3b-4a}{5} = \frac{3+6a}{6}$$

$$5(4a+3b) + 8(3b-4a) = 4(3+6a)$$

$$20a+15b+24b-32a = 12+24a$$

(6)

$$\frac{x}{8} + \frac{x}{18} + \frac{x}{42} + \frac{x}{18} + \frac{x}{8} = \frac{x}{42} + \frac{x}{23x-6}$$

$$\frac{x}{2} + \frac{x}{42} + \frac{x}{42} + \frac{1}{6} = \frac{18x+30}{6(23x-6)}$$

$$\frac{x}{2} + \frac{x}{42} + \frac{1}{6} = \frac{18x+30}{6(23x-6)} \therefore \frac{1}{6} = \frac{18x+30}{6(23x-6)}$$

$$1 = \frac{18x+30}{23x-6} \therefore 23x-6 = 18x+30$$

$$\therefore 5x = 36 \therefore x = 8$$

$$(23) \frac{14x^2 - 2x^3}{14(2x-1)} = \frac{1+3x}{23} - \frac{2x-\frac{11}{2}}{5} + \frac{1}{1.5}$$

$$\frac{14x^2 - 2x^3}{30} = \frac{1+3x}{23} - \frac{x}{2} + \frac{11}{30} + \frac{1}{104}$$

$$\frac{14x^2 - 2x^3}{30} - \frac{11}{30} - \frac{1}{104} = \frac{1+3x}{23} - \frac{x}{2} + \frac{1}{104}$$

$$\frac{1}{30} - \frac{1}{2(2x-1)} + \frac{x^2}{6(2x-1)} = \frac{1}{104} + \frac{x(2x-1)}{6(2x-1)}$$

$$\frac{1}{30} - \frac{1}{24} - \frac{1}{2(2x-1)} + \frac{x^2 - x(2x-1)}{6(2x-1)} = 0$$

$$\frac{1}{30} - \frac{1}{24} - \frac{1}{2(2x-1)} + \frac{x}{6(2x-1)} = 0$$

(17)

$$\frac{-4}{29} = \frac{1}{x-9} \left(\frac{1}{2} - \frac{x}{3} \right) \therefore \frac{1}{x-9} = \frac{1}{18(x-9)} (6-2x)$$

$$\frac{1}{3} = \frac{1}{x-9} (6-2x) \therefore x-9 = 29-6x$$

$$6x = 29 \therefore x = 3\frac{2}{3}$$

$$(24) \frac{9x+20}{36} = \frac{4x-12}{5x-8} + \frac{x}{8}$$

$$\frac{9x+20}{36} - \frac{x}{8} = \frac{4x-12}{5x-8} \therefore \frac{20}{36} = \frac{4x-12}{5x-8}$$

$$\frac{5}{9} = \frac{4x-12}{5x-8} \therefore 25x-20 = 36x-90$$

$$\therefore 11x = 70 \therefore x = \frac{70}{11}$$

$$(25) \frac{20x+36}{24} + \frac{4x+20}{9x-16} = \frac{4x}{5} + \frac{40}{24}$$

$$\frac{4x}{6} + \frac{36}{24} + \frac{4(x+8)}{9x-16} = \frac{4x}{5} + \frac{40}{24}$$

$$\therefore \frac{4(x+8)}{9x-16} = \frac{12}{24} \therefore 92x+400 = 90x-192$$

$$\therefore 90x = -692 \therefore x = -8\frac{17}{20}$$



(C)

$$(26) \frac{90x-15}{25} + \frac{99x+29}{6x+18} = \frac{9x+19}{9}$$

$$\frac{90x-15}{18} + \frac{99x+29}{3x+9} = \frac{9x+19}{9}$$

$$\frac{9x}{9} - \frac{15}{18} + \frac{99x+29}{3x+9} = \frac{9x}{9} + \frac{19}{9}$$

$$\therefore \frac{99x+29}{3x+9} = \frac{15}{18} = \frac{5}{6} \therefore \frac{99x+29}{3x+9} = \frac{5}{6}$$

$$22x+82 = 29x+49 \therefore x=6$$

$$(27) \frac{2x+1}{5} - \frac{93x-2}{10x-32} + \frac{x}{3} = \frac{4x}{12} - \frac{x+96}{36}$$

$$\frac{2x+36}{36} + \frac{12x}{36} - \frac{29x}{36} + \frac{x+96}{36} = \frac{93x-2}{10x-32}$$

$$\frac{40}{36} = \frac{93x-2}{10x-32} \therefore \frac{25}{18} = \frac{93x-2}{10x-32}$$

$$25(10x-32) = 18(93x-2)$$

$$425x-800 = 234x-36$$

$$\therefore 99x = 764 \therefore x = \frac{764}{99} = 8$$

(9)

$$(28) \quad 29 + \frac{3x-99}{9x} = \frac{4x-4}{x} + \frac{90-6x}{2}$$

$$\frac{33x + 3x - 99}{9x} = \frac{4x - 4 + 300 - 2x}{x}$$

$$\frac{324 + 3x}{2} = \frac{-2x + 303}{1} \therefore 324 + 3x = -4x + 606$$

$$\therefore 8x = 606 - 324 = 282 \therefore x = \frac{282}{8} = 35.25$$

$$(29) \quad \frac{29-3x}{3} - \frac{4x+4}{9} = 5 - \frac{4x+9}{8}$$

$$\frac{63-9x}{9} - \frac{4x+4}{9} = \frac{28}{8} - \frac{4x+9}{8}$$

$$\frac{63-9x-4x-4}{9} = \frac{28-4x-9}{8}$$

$$\frac{59-13x}{9} = \frac{28-4x}{8} \therefore 224 - 52x = 207 - 45x$$

$$-7x = 207 - 224 = -17 \therefore x = \frac{-17}{-7} = 2.428$$

$$(30) \quad \frac{4x-29}{9} + \frac{3}{8} + \frac{40-3x}{8} = 289 - \frac{4x-96}{12} - 99x$$

$$\frac{4x}{9} - \frac{6}{3} + \frac{3}{8} + \frac{9}{8} - \frac{3x}{8} = 289 - \frac{4x}{12} + 8 - 99x$$

$$\frac{4x}{9} - \frac{3x}{8} + \frac{4x}{12} + 99x = 289 + 8 + \frac{6}{3} - \frac{3}{8} - \frac{9}{8}$$

(90)

$$\frac{96x}{36} + \frac{96x}{36} + 99x = 249 + \frac{6}{3} - 10$$

$$\frac{8x}{3} + 99x = 239 \frac{6}{3} \therefore \frac{8x}{3} + 99x = \frac{600}{3}$$

$$99 \frac{8}{3}x = \frac{600}{3} \therefore \frac{300x}{3} = \frac{600}{3} \therefore x = \frac{600}{9} \times \frac{3}{300} = 29$$

$$(39) \quad x - \frac{\frac{2x-3}{3} - \frac{3x-9}{4}}{x-1} = \frac{3}{2} \left(\frac{x+2}{3x-2} \right)$$

$$\frac{x}{2} - \frac{2}{3} \frac{(2x-3)}{(x-1)} + \frac{2}{4} \frac{(3x-9)}{(x-1)} = \frac{3}{2} \frac{(x+2)}{(3x-2)}$$

$$\frac{x}{2} + \frac{1}{x-1} \left(\frac{2x-9}{2} - \frac{2x}{2} + 2 \right) = \frac{3}{2} \frac{(x+2)}{3x-2}$$

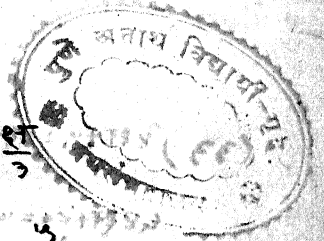
$$\frac{x}{2} + \frac{1}{x-1} \left(\frac{4x}{2} + 2 \right) = \frac{3}{2} \frac{(x+2)}{3x-2}$$

$$x + \frac{1}{x-1} \left(\frac{4x+4}{2} \right) = \frac{3}{2} \frac{(x+2)}{3x-2}$$

$$\frac{x + \frac{4x}{2} + 2}{x-1} = \frac{3}{2} \frac{(x+2)}{3x-2} \therefore \frac{x + 2x + 2}{x-1} = \frac{3}{2} \frac{(x+2)}{3x-2}$$

$$\frac{3x+2}{x-1} = \frac{3}{2} \frac{(x+2)}{3x-2}$$

(99)



$$\therefore 3x - \frac{8x}{3} = 6x - 3x \therefore 3x = 6x - 9x + \frac{8x}{3}$$

$$3x = -3x + \frac{8x}{3} \therefore x = \frac{-3 + \frac{8}{3}}{3} = -1 + \frac{8}{9} = -\frac{1}{9}$$

(32) $\frac{14x+6}{3x+1} + \frac{20x-12}{4x-2} = \frac{900-6x}{13-x}$ (86)

$$\frac{14x+6+3}{3x+1} + \frac{20x-6-8}{4x-2} = \frac{900-9x-10+3x}{13-x}$$
 (100)

$$\frac{4(3x+9)+3}{3x+1} + \frac{8(4x-2)-8}{4x-2} = \frac{9(13-x)-10+3x}{13-x}$$

$$4 + \frac{3}{3x+1} + 8 - \frac{4}{4x-2} = 9 + \frac{3x-10}{13-x}$$

$$\therefore \frac{3}{3x+1} - \frac{4}{4x-2} = \frac{3x-10}{13-x}$$

$$\frac{3(4x-2) - 4(3x+1)}{(3x+1)(4x-2)} = \frac{3x-10}{13-x}$$

$$\frac{14x-6-12x-4}{(3x+1)(4x-2)} = \frac{3x-10}{13-x} \therefore \frac{2x-10}{(3x+1)(4x-2)} = \frac{3x-10}{13-x}$$

$$\therefore \frac{2x-10}{13-x} = 1 = \frac{2x-10}{13-x} = 13-x \therefore 2x-10 = 13-x$$

$$\therefore 2x-10 = 13-x \therefore 3x = 23 \therefore x = \frac{23}{3}$$

(१२)

$$(33) \quad 8x+9 : 3x+10 :: 90 : 16$$

$$64x+60 = 49x+110 \therefore 15x=50 \therefore x = \frac{50}{15} = \frac{10}{3}$$

$$(34) \quad \frac{90+x}{4} : \frac{8x-9}{3} :: 18 : 5$$

$$\therefore 90+x = 4x-12 \therefore 3x=2 \therefore x = \frac{2}{3}$$

$$(35) \quad \frac{90-8x}{8} : \frac{15+2x}{3} - 2x = 4 : 2$$

$$90-8x = \frac{15+90x}{3} - 90x \therefore 90+6x = \frac{15+90x}{3}$$

$$\therefore 49+90x = 15+90x \therefore 0x = 24 \therefore x = 3$$

$$(36) \quad 96x+9 : \frac{8x+18}{9x+31} :: 36x+10 : 9$$

$$\therefore 96x+9 = \frac{8x+18}{9x+31} \times (36x+10)$$

$$96x^2+84x+81x+99x = 18x^2+80x+40x+90$$

$$84x+81x+99x = 80x+40x+90$$

$$489x+99x = 40x+90 \therefore 3x = 9 \therefore x = 3$$

$$(37) \quad \frac{8x+3}{6x-43} : 9 :: 2x+19 : 3x-19$$

(93)

$$\therefore 8x + 3$$

$$\frac{6x - 43}{6x - 43} \times 3x - 99 = 2x + 99 \therefore (8x - 3)(3x - 99) = (2x + 99)(6x - 43)$$

$$92x^2 - 66x + 99x - 43 = 92x^2 - 66x + 118x - 490$$

$$\therefore -66x + 99x - 43 = -66x + 118x - 490 \therefore -66x - 43 = 2x - 490$$

$$-66x - 2x = -490 + 43 \therefore -68x = -447 \therefore x = \frac{-447}{-68} = \frac{447}{68} = c$$

(3c) अ+क्ष: अ-क्ष: ब: क

$$\therefore (अ+क्ष) + (अ-क्ष) : (अ+क्ष) - (अ-क्ष) :: ब+क : ब-क$$

$$\therefore 2अ : 2क्ष :: ब+क : ब-क :: क्ष : अ :: ब+क : ब-क$$

$$\therefore क्ष = \frac{अ(ब+क)}{ब-क}$$

(3d) $3x^2 + 4x - 5 : 8x^2 - 6x + 10 :: 21 : 25$

$$\therefore \frac{8x^2 - 6x + 10}{3x^2 + 4x - 5} = \frac{25}{21} = \frac{4}{3} \therefore 92x^2 - 24x + 21 = 12x^2 + 20x - 24$$

$$-24x + 21 = 20x - 24 \therefore 44x = 45 \therefore x = \frac{45}{44}$$

(40) $\frac{3}{2}x^2 + \frac{4}{3}x - \frac{5}{6} : \frac{8}{5}x^2 - \frac{3}{5}x + \frac{11}{5} :: 94 : 5$

(98)

$$3x + \frac{5x}{3} - \frac{4}{3} = \frac{8}{5}x - \frac{3}{6}x + \frac{8}{5} :: 30 = 6$$

$$9x + 5x - 4 = \frac{8}{5}x - \frac{3}{6}x + \frac{8}{5} :: 90 = 6$$

$$9x + 5x - 4 = 8x - \frac{9x}{6} + \frac{20}{5} :: 90 = 80 :: 9 = 8$$

$$9x + 5x - 4 = 20x - \frac{9x}{6} + \frac{980}{5} :: 9 = 20$$

$$9x + 5x - 4 = 252x - 99x + 980 :: 9 = 20$$

$$252x + 228x - 980 = 252x - 99x + 980$$

$$: 228x - 980 = -99x + 980 :: 359x = 2000 :: x = \frac{2000}{359}$$

$$(89) \sqrt{x} + \sqrt{x-9} = \sqrt{x-9}$$

$$\sqrt{x} \sqrt{x-9} + x - 9 = 36 :: \sqrt{x} \sqrt{x-9} = 45 - x$$

$$: x - 9 = 2025 - 90x + x^2 :: 69x = 2025$$

$$: x = \frac{2025}{69} = \frac{225}{9} = 25$$

$$(82) \sqrt{9+x} \sqrt{x^2+9} = 9+x$$

$$9 + x \sqrt{x^2+9} = 9 + 2x + x^2$$

$$: x \sqrt{x^2+9} = 2x + x^2 :: \sqrt{x^2+9} = 2+x$$

(१५)

$$\therefore \sqrt{a^2+12} = 4+4\sqrt{a^2-1} \therefore 4\sqrt{a^2-1} = 4 \therefore \sqrt{a^2-1} = 1$$

$$(४३) \frac{a}{\sqrt{a^2-1}} = b \therefore \sqrt{a^2-1} = \frac{a}{b}$$

$$\therefore \sqrt{a^2-1} = \frac{a}{b} + 1 \therefore a^2-1 = \left(\frac{a}{b} + 1\right)^2$$

$$a^2 - 1 = \frac{a^2}{b^2} + \frac{2a}{b} + 1 \therefore a^2 - \frac{a^2}{b^2} = \frac{2a}{b} + 2$$

$$\frac{a^2(b^2-1)}{b^2} = \frac{2a(b+1)}{b}$$

$$(४४) \frac{\sqrt{a}-\sqrt{a-1}}{\sqrt{a}+\sqrt{a-1}} = a$$

$$\therefore \sqrt{a}-\sqrt{a-1} = a\sqrt{a}+a\sqrt{a-1} \text{ वेदसोडऊन}$$

$$-a\sqrt{a}+a\sqrt{a-1} = \sqrt{a-1} + \sqrt{a-1} = \sqrt{a-1}(a+1)$$

$$\therefore \sqrt{a}(1-a) = \sqrt{a-1}(1+a) \therefore \frac{\sqrt{a-1}}{\sqrt{a}} = \frac{1-a}{1+a}$$

$$\frac{a-1}{a} = \frac{1-a^2}{1+a^2} \therefore \frac{1-a^2}{1+a^2} = \frac{1-a^2}{1+a^2}$$

$$\frac{1-a^2}{1+a^2} = \frac{1-a^2}{1+a^2} \therefore 1-a^2 = 1-a^2$$

(16)

$$(89) \frac{अ+क्ष+\sqrt{२अक्ष+क्ष^२}}{अ+क्ष-\sqrt{२अक्ष+क्ष^२}} = ब$$

$$अ+क्ष+\sqrt{२अक्ष+क्ष^२} = ब(अ+क्ष) - ब\sqrt{२अक्ष+क्ष^२}$$

$$\therefore \sqrt{२अक्ष+क्ष^२}(१+ब) = (अ+क्ष)(ब-१)$$

$$\therefore (२अक्ष+क्ष^२)(१+ब)^२ = (अ+क्ष)^२(ब-१)^२$$

$$(२अक्ष+क्ष^२)(१+ब) = अ(ब-१) + (ब-१)(२अक्ष+क्ष^२)$$

$$(२अक्ष+क्ष^२)((ब+१)^२ - (ब-१)^२) = अ(ब-१)^२$$

$$(२अक्ष+क्ष^२) \times ४ब = अ(ब-१)^२ \therefore २अक्ष+क्ष^२ = \frac{अ(ब-१)^२}{४ब}$$

$$अ दो होकडे निघवून अ+२अक्ष+क्ष^२ = अ + \frac{अ(ब-१)^२}{४ब}$$

$$\text{वर्गमूल कावून } अ+क्ष = \sqrt{अ + \frac{अ(ब-१)^२}{४ब}} = अ \sqrt{१ + \frac{(ब-१)^२}{४ब}}$$

$$\text{स्थ० क्ष} = अ \sqrt{१ + \frac{(ब-१)^२}{४ब}} - अ = अ \sqrt{\frac{४ब + (ब-१)^२}{४ब}} - अ$$

(१)

वर्गसमीकरणं.



वर्गसमीकरण एकाकी किंवा संयुक्त असतें.

एकाकी वर्गसमीकरण तेंच होय की ज्यांत अव्यक्त पदाना वर्ग मात्र येतो; जसें—

$$x^2 = 4; \quad 3x^2 = 48; \quad \frac{x^2}{4} = 60; \quad 3x^2 = \frac{96}{4}; \quad अक्षर = 4$$

या जातीचें वर्गसमीकरण सोडविण्याची रीति.

एक वर्गसमीकरणांत जशी अव्यक्त पदाना किंमत म्हणजे क्षत्री किंमत शोधून काढतां तशी येथेंही क्षत्री किंमत पहिल्याने शोधून काढावी. नंतर दोहों वाजूंचें वर्गमूळ काढावें म्हणजे अव्यक्त पदाना किंमत निघेल.

उदाहरणे.

(१) $3x^2 + 4x^2 = 20$

$7x^2 = 20$

$x^2 = \frac{20}{7}$

$x = \pm \sqrt{\frac{20}{7}}$

(२) $\frac{x^2}{4} - \frac{3x^2}{4} = 9$

$\frac{x^2}{4} = 9 \therefore x^2 = 36$

वर्गमूळ काढून $x = \pm 6$

कोणत्याही धन संख्येचें वर्गमूळ धन किंवा ऋण असतें; कारण धना धनाचा किंवा ऋणा ऋणाचा गुणाकार सर्वदा धन होतो म्हणून वर्गमूळ धन किंवा ऋण आहे हें दशांबर समजत नाही याजकरितां वर्गमुळापुढें \pm हें निम्न लिहितान.

(२)

वर्गसमीकरणे.

$$(३) \frac{३४x^२+४}{५} + \frac{५४x^२+७}{५} = ६$$

$$२७x^२+३६+२५x^२+३५ = २७०$$

$$५२x^२+७१ = २७०$$

$$५२x^२ = १९९$$

$$x^२ = \frac{१९९}{५२} \therefore \text{वर्गमूलकादून } x = \pm \sqrt{\frac{१९९}{५२}}$$

$$(४) \frac{वक्ष^२}{अ} + \frac{अक्ष^२}{ब} = क$$

$$क्ष^२ \left(\frac{ब}{अ} + \frac{अ}{ब} \right) = क \therefore क्ष^२ = \frac{क}{\frac{ब}{अ} + \frac{अ}{ब}}$$

$$\text{वर्गमूलकादून } क्ष = \pm \sqrt{\frac{अबक}{अ^२+ब^२}}$$

संयुक्तवर्गसमीकरणे फार करून खाली लिहिलेले तीन रूपांत असतात, जर नसल्यास त्या पैकीं एकादें रूप देतां येतें.

पहिल्या रूपांतील समीकरणांत वर्ग पदाचा गुणक एक असून दुसऱ्या पदाचा गुणक पूर्ण सम संख्या असते म्हणजे त्याला दोहोनीं भागिलें तर भाग बरोबर तुटतो.

(३)

वर्गसमीकरणे

उदाहरणे.

- (१) $१क्ष + २क्ष = ८$
- (२) $१क्ष + ६क्ष = १५$
- (३) $१क्ष + १०क्ष = २४$
- (४) $१क्ष + २अक्ष = २४अ$
- (५) $१क्ष + २क्ष = १६$
- (६) $१क्ष - ६क्ष = ५५$
- (७) $१क्ष - १२क्ष = ६४$
- (८) $१क्ष - ४अवक्ष = ५अव$

या सर्व समीकरणांत प्रथम पद म्हणजे वर्ग पद याचा गुणक १ असून दुसरे पदाचा गुणक असा एक आहे की ज्याला दोहोनीं भागिलें तर भाग बरोबर तुटतो.

दुसरे रूपांतील समीकरणांत वर्ग पदाचा गुणक एक असून दुसऱ्या पदाचा पूर्ण विपम संख्या असतो म्हणजे तिला दोहोनीं भागिलें तर भाग बरोबर तुटत नाही.

(४)

वर्गसमीकरणे.

उदाहरणे.

(१) $२० + ३६ = ५६$

(२) $२० + ५६ = ७६$

(३) $२० - ७६ = -५६$

(४) $२० - ५६ = -३६$

या सर्व समीकरणांत प्रथमपदाचा गुणक १ आहे. आणि दुसऱ्या पदाचा गुणक असा आहे की त्याला दोहोनी भागिले तर भागवशेवर तुटत नाही.

तिसऱ्या रूपांनील समीकरणांत दुसऱ्या पदाचा गुणक कांहीं पूर्ण संख्या असते. परंतु पहिल्याचा मात्र १ शिवाय करून दुसरी पूर्ण संख्या असते. जसे-

(१) $३६ + ४६ = ८२$

(२) $३६ + ५६ = ९२$

(३) $५६ + ६६ = १२२$

(४) $३६ + ४६ = ८२$

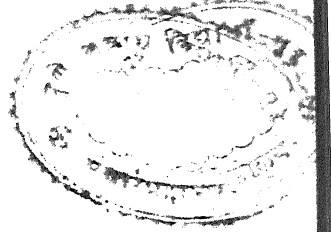
(५) $५६ + ६६ = १२२$

(६) $१२६ - ७६ = ५०$

या सर्व समीकरणांत पहिल्या पदाचा गुणक १ शिवाय करून कांहीं पूर्ण संख्या आहे आणि दुसरे किती एकामध्ये सम पूर्ण संख्या आहे व किती एकामध्ये विषम पूर्ण संख्या आहे व किती एकांत १ आहे.

(५)

वर्गसमीकरणें.



$$(७) ६क्ष^2 - ८क्ष = -२$$

$$(८) अक्ष^2 - कक्ष = ब$$

$$(९) ५क्ष^2 - क्ष = ३१५$$

या तीन रूपां खेरीज दुसरे रूपांत समीकरणें असल्यास या रूपां पैकीं ए-

कादें रूप देतां येतें. जसें -

$$(१) \frac{क्ष^2}{४} + ३क्ष = ७$$

∴ छेदमोडवून क्ष + १२क्ष = २८; हें पहिल्या रूपांत आलें.

$$(२) \frac{क्ष^2}{५} - ३क्ष = -१०$$

∴ क्ष - १५क्ष = -५० हें दुसरे रूपांत आलें.

$$(३) \frac{क्ष^2}{४} - \frac{३क्ष}{४} = १$$

∴ क्ष - ३क्ष = ४; हेंही दुसरे रूपांत आलें.

$$(४) \frac{३क्ष^2}{४} - \frac{५क्ष}{२} = -२ ∴ ६क्ष^2 - २०क्ष = -१६; हें तिसऱ्या रूपांत आलें.$$

$$(५) \frac{क्ष^2}{अ} + \frac{बक्ष}{क} = स ∴ कक्ष + अबक्ष = अकक्ष; हेंही तिसऱ्या रूपांत आलें.$$

(६)

वर्गसमीकरणं.

(६) क्ष + $\frac{४क्ष}{५}$ = २९ ∴ ५क्ष + ४क्ष = १४५; हे तिसर्या रूपांत आले.

(७) क्ष + ५क्ष = $\frac{११}{४}$ ∴ ४क्ष + २०क्ष = ११; हे तिसर्या रूपांत आले.

आतां त्या तीन रूपांतील समीकरणे सोडविण्याकरितां सारणात्तिहिते

पहिल्या रूपांतील समीकरणे सोडविण्याकरितां सारणी.

$$\therefore दु = \pm \sqrt{ति + \left(\frac{दु \cdot गु}{२}\right)^२} - \left(\frac{दु \cdot गु}{२}\right)$$

उदाहरणं.

(१) क्ष + ४क्ष = ९६ एथें दु = क्ष, दुगु = ४, आणि ति = ९६

* दु म्हणजे दुसरें पद ति म्हणजे तिसरें पद; प म्हणजे पहिलें पद. बा-

च रीतिनें दुगु दुसऱ्या पदाचा गुणक; पगु, पहिल्या पदाचा गुणक, असे-

४क्ष + ५क्ष = ९ यांत ४ यास पगु, ५ यास दुगु; क्ष यास प, ९ यास

ति आणि अक्ष - बक्ष = क यांत क्ष = पक्ष = दु; क = ति; अ = पगु; ब = दुगु

तसेंच ४अक्ष + ३बक्ष = र; यांत क्ष = पक्ष = दु; र = ति. आणि ४अ = प

- ३ब = दुगु; म्हणून प = दु.

(७)

वर्गसमीकरणों

$$\therefore x = \pm \sqrt{9x + \left(\frac{x}{2}\right)^2} \pm \left(\frac{x}{2}\right) = \pm \sqrt{9x + x - 2}$$

$$\therefore x = \pm 10 - 2 = 8 \text{ अथवा उणे } -12$$

(२) $x + 6x = 12$, एथें दु = x , दुगु = 6 आणि ती = 12

$$\therefore x = \pm \sqrt{12 + \left(\frac{6x}{2}\right)^2} - \frac{6x}{2} = \pm \sqrt{12 + 9x - 3}$$

$$\therefore x = \pm 5 - 3 = 2 \text{ अथवा } -6$$

(३) $x - 6x = 20$, एथें दु = x , दुगु = -6 , आणि ति = 20

$$\therefore x = \pm \sqrt{20 + \left(\frac{-6x}{2}\right)^2} - (-6x) = \pm \sqrt{20 + 9x + 4}$$

$$\therefore x = \pm 6 + 4 = 10 \text{ अथवा } -2$$

(४) $x - 2x = 6$, एथें दु = x , दुगु = -2 , आणि ति = 6

$$\therefore x = \pm \sqrt{6 + \left(\frac{-2x}{2}\right)^2} - (-2x) = \pm \sqrt{6 + 1 + 1} = \pm \sqrt{8 + 1}$$

$$\therefore x = \pm 3 + 1 = 4 \text{ अथवा } -2$$

1. * पहिल्या व दुसऱ्या रूपातील समीकरणांत दोन्ही उत्तरांचा गुणाकार करून त्यांचे वि-
नू बदलले असता ति सरें पद होतें. आणि दोन उत्तरांची बेरीज घेऊन विनू बदलले असतां दु-
सऱ्या पदाचा गुणक होतो.

(८)

वर्गसमीकरणं.

(५) क्ष-१२क्ष=-२०, एथें दु=क्ष, दुयु=-१२ आणि ति=२०

$$\therefore \text{क्ष} = \pm \sqrt{-20 + \left(\frac{-12}{2}\right)^2} - \left(\frac{-12}{2}\right) = \pm \sqrt{-20 + 36} + 6$$

$$\therefore \text{क्ष} = \pm 4 + 6 = 10 \text{ अथवा } +2$$

(६) क्ष-२अक्ष=८अ, एथें दु=क्ष, दुयु=-२ आणि ति=८अ^२

$$\therefore \text{क्ष} = \pm \sqrt{8\text{अ} + \left(\frac{-2\text{अ}}{2}\right)^2} - \left(\frac{-2\text{अ}}{2}\right) = \pm \sqrt{8\text{अ} + \text{अ}^2} + \text{अ}$$
$$= \pm 3\text{अ} + \text{अ} = 4\text{अ} \text{ अथवा } -2\text{अ}$$

उदाहरणें.

(१) क्ष+४क्ष=१२

$$\therefore \text{क्ष} = \sqrt{12 + 4} - 2$$

$$\therefore \text{क्ष} = \pm 4 - 2 = 2 \text{ अथवा } -6$$

(३) क्ष+१४क्ष=-२४

$$\therefore \text{क्ष} = \pm \sqrt{-24 + 49} - 7$$

$$\therefore \text{क्ष} = \pm 5 - 7 = -2 \text{ अथवा } -12$$

(२) क्ष+६क्ष=२७

$$\therefore \text{क्ष} = \pm \sqrt{27 + 9} - 3$$

$$\therefore \text{क्ष} = \pm 6 - 3 = 3 \text{ अथवा } -9$$

(४) क्ष+४अक्ष=५अ^२

$$\therefore \text{क्ष} = \pm \sqrt{5\text{अ}^2 + 4\text{अ}^2} - 2\text{अ}$$

$$\therefore \text{क्ष} = \pm 3\text{अ} - 2\text{अ} = \text{अ} \text{ अथवा } -5\text{अ}$$

(९)

वर्गसमीकरणों.

(५) $x^2 - 9x = 68$

$$\therefore x = \pm \sqrt{81 + 36} + 9$$

$$\therefore x = \pm 10 + 9 \therefore x = 19 \text{ अथवा } -8$$

(६) $x^2 - 2x = 24$

$$\therefore x = \pm \sqrt{4 + 96} + 1$$

$$\therefore x = \pm 10 + 1 = 11 \text{ अथवा } -9$$

(७) $x^2 - 3x = 39$

$$\therefore x = \pm \sqrt{9 + 156} + 1.5$$

$$\therefore x = \pm 13 + 1.5 = 14.5 \text{ अथवा } -11.5$$

(८) $x^2 - 4x = -8$

$$\therefore x = \pm \sqrt{16 + 8} + 2$$

$$\therefore x = \pm 4 + 2 = 6$$

(९) $x^2 - 6x = -9$

$$\therefore x = \pm \sqrt{9 + 9} + 3$$

$$\therefore x = \pm 3 + 3 = 6$$

(१०) $x^2 - 8x = 22$

$$\therefore x = \pm \sqrt{64 + 88} + 4$$

$$\therefore x = \pm 12 + 4 = 16 \text{ अथवा } -8$$

(११) $x^2 - 5\sqrt{3}x = 9\sqrt{3}$

$$\therefore x = \pm \sqrt{75 + 36\sqrt{3}} + 2.5\sqrt{3}$$

$$\therefore x = \pm 5\sqrt{3} + 2.5\sqrt{3}$$

$$\therefore x = 7.5\sqrt{3} \text{ अथवा } -2.5\sqrt{3}$$

(१२) $x^2 + 4x = 96$

$$\therefore x = \pm \sqrt{16 + 384} + 2 = \pm 20 + 2$$

$$\therefore x = 22 \text{ अथवा } -18$$

(१०)

वर्गसमीकरणे.

$$\therefore x = 2 \text{ अथवा } \sqrt{-92}$$

$$(96) 2x^2 + 92x = 14$$

$$(93) \frac{1}{x^2} + \frac{8}{x} = 84$$

$$\therefore x^2 + 8x = 4$$

$$\therefore \frac{1}{x^2} + 8\left(\frac{1}{x}\right) = 84$$

$$\therefore x = \pm \sqrt{4+8-2}$$

$$\therefore \frac{1}{x} = \pm \sqrt{4+8-2}$$

$$\therefore x = \pm 2-2=0 \text{ अथवा } -4$$

$$\therefore \frac{1}{x} = \pm 0-2 = -2 \text{ अथवा } -4 \quad (97) \frac{x^2}{x^2} + x = 92$$

$$(98) 8x^2 + 96x = 80$$

$$\therefore x^2 + 2x = 20$$

$$\therefore x^2 + 8x = 92$$

$$\therefore x = \pm \sqrt{20+4-1}$$

$$\therefore x = \pm \sqrt{92+8-2}$$

$$\therefore x = \pm 4-4 = 0 \text{ अथवा } -8$$

$$\therefore x = \pm 4-2 = 2 \text{ अथवा } -6 \quad (99) \frac{x^2}{x^2} - 2x = 92$$

$$(95) 5x^2 - 10x = 80$$

$$\therefore x^2 - 2x = 80$$

$$\therefore x^2 - 2x = 0$$

$$\therefore x = \pm \sqrt{80+100+4}$$

$$\therefore x = \pm \sqrt{0+1} + 1$$

$$\therefore x = \pm 0 + 8 = 8 \text{ अथवा } -8$$

$$\therefore x = \pm 3+1 = 4 \text{ अथवा } -2 \quad (99) \frac{1}{x^2} - \frac{2}{x} = -22$$

(11)

वर्गसमीकरणं.



$$\therefore \frac{9}{x^2} - 2x \left(\frac{9}{x^2} \right) = -22 \quad \therefore x^2 - 8x = 8 \text{ अथवा } 2x$$

$$\therefore \frac{9}{x^2} = \pm \sqrt{-22 + 984 + 92} \quad \therefore x = \pm \sqrt{2x + 8 + 2} = \pm \sqrt{8 + 2}$$

$$= \pm 99 + 92 = 9 \text{ अथवा } 22 \quad \therefore x = \pm 2\sqrt{10 + 2} \text{ अथवा}$$

$$x^2 = 9 \text{ अथवा } \frac{1}{2} \therefore x = 9 \text{ अथवा } x = \pm \sqrt{8 + 8 + 2} = \pm 2\sqrt{2 + 2}$$

$\frac{8}{x}$

$$(19) \frac{9x^2}{x^2} + \frac{8x}{x} = 6$$

$$(20) x^2 - 8\sqrt{x^2 - 8x} = 8x + 92$$

$$\therefore \left(\frac{8x}{x} \right)^2 + 2 \cdot \frac{8x}{x} = 6$$

$$x^2 - 8x - 8\sqrt{x^2 - 8x} = 92$$

$$\therefore \frac{8x}{x} = \pm \sqrt{6 + 1 - 9}$$

$$\therefore (x^2 - 8x) = \pm \sqrt{92 + 8 + 2}$$

$$\therefore \frac{8x}{x} = \pm 2 - 9 = 2 \text{ अथवा } -8$$

$$\therefore (x^2 - 8x) = \pm 8 + 2 = 10 \text{ अथवा } -6$$

$$\therefore x = \frac{2x}{2} \text{ अथवा } \frac{-8x}{2}$$

$$(22) x^2 - 2x + 6\sqrt{2x^2 - 6x + 7} = 20$$

$$\therefore 2x^2 - 6x + 10\sqrt{2x^2 - 6x + 7} = 69$$

$$\therefore 2x^2 - 6x + 10 + 10\sqrt{2x^2 - 6x + 7} = 69$$

$$\sqrt{2x^2 - 6x + 7} = \pm \sqrt{69 + 69 - 9} = \pm 92 - 9 = 8 \text{ अथवा } -22$$

(१२)

वर्गसमीकरणे.

$$\therefore ३\text{क्ष}^२ - ६\text{क्ष} + ७ = १६ \text{ अथवा } ४०४$$

$$\therefore ३\text{क्ष}^२ - ६\text{क्ष} = ९ = \therefore \text{क्ष}^२ - २\text{क्ष} = ३$$

$$\therefore \text{क्ष} = \pm \sqrt{३+१} + १ = \pm २ + १ = ३ \text{ अथवा } -१$$

दुसऱ्या रूपांतील वर्गसमीकरणे सोडविण्याकरितां सारणी.

$$\text{दु} = \frac{१}{३} (\pm \sqrt{४\text{ति} + (\text{दुग})^२} - (\text{दुग}))$$

उदाहरणे.

(१) $\text{क्ष} + ३\text{क्ष} = २८$, एथें $\text{दु} = \text{क्ष}$, $\text{दुगु} = ३$, आणि $\text{ति} = २८$

$$\therefore \text{क्ष} = \frac{१}{३} (\pm \sqrt{४ + २८ + (३)^२} - ३) = \frac{१}{३} (\pm \sqrt{११२ + ९ - ३})$$

$$\therefore \text{क्ष} = \frac{१}{३} (\pm ११ - ३) = \frac{८}{३} \text{ अथवा } -\frac{१६}{३} = ४ \text{ अथवा } -७$$

(२) $\text{क्ष} + ७\text{क्ष} = ८$, एथें $\text{दु} = \text{क्ष}$, $\text{दुगु} = ७$, आणि $\text{ति} = ८$

$$\therefore \text{क्ष} = \frac{१}{३} (\pm \sqrt{३२ + (७)^२ - ७}) = \pm \frac{१}{३} (\pm \sqrt{३२ + ४९ - ७})$$

$$\therefore \text{क्ष} = \frac{१}{३} (\pm ९ - ७) = \frac{२}{३} \text{ अथवा } -\frac{१६}{३} = १ \text{ अथवा } -८$$

(३) $\text{क्ष} + १७\text{क्ष} = -१६$, एथें $\text{दु} = \text{क्ष}$, $\text{दुगु} = १७$, आणि $\text{ति} = -१६$

$$\therefore \text{क्ष} = \frac{1}{2} (\pm \sqrt{-64 + 200 - 99}) = \frac{1}{2} (\pm 15 - 99)$$

$$\therefore \text{क्ष} = -9 \text{ अथवा } -96$$

(४) क्ष-५क्ष=६, एथें दु=क्ष, दुगु=-५ आणि ति=६

$$\therefore \text{क्ष} = \frac{1}{2} (\pm \sqrt{4 \times 6 + (-5)^2 + 5}) = \frac{1}{2} (\pm \sqrt{24 + 25 + 5})$$

$$\therefore \text{क्ष} = \frac{1}{2} (\pm 7 + 5) = 6 \text{ अथवा } -9$$

(५) क्ष-९क्ष=-२० एथें दु=क्ष, दुगु=-९, आणि ति=-२०

$$\therefore \text{क्ष} = \frac{1}{2} (\pm \sqrt{-60 + 81 + 9}) \therefore \text{क्ष} = \frac{1}{2} (\pm 9 + 9)$$

$$\therefore \text{क्ष} = 9 \text{ अथवा } 0$$

(६) क्ष-३अक्ष=४अ, एथें दु=क्ष, दुगु=-३अ आणि ति=४अ

$$\therefore \text{क्ष} = \frac{1}{2} (\pm \sqrt{16अ + 9अ + 3अ})$$

$$\therefore \text{क्ष} = \frac{1}{2} (\pm 5अ + 3अ)$$

$$\text{क्ष} = 4अ \text{ अथवा } -अ$$

(१४)

वर्गसमीकरणं.

(१) $x^2 + 5x = 18$

$x = \frac{-5 \pm \sqrt{25 + 72}}{2} = 4, \text{ अथवा } -9$

$x = \frac{-5 \pm \sqrt{97}}{2}$

(५) $x^2 - 15x = -18$

$x = \frac{15 \pm \sqrt{225 + 72}}{2}$

$x = \frac{15 \pm \sqrt{297}}{2}$

$x = 2, \text{ अथवा } -9$

$x = \frac{15 \pm \sqrt{369}}{2} = 18, \text{ अथवा } 1$

(२) $x^2 + 9x = 52$

(६) $x^2 - x = 20$

$x = \frac{-9 \pm \sqrt{81 + 208}}{2}$

$x = \frac{1 \pm \sqrt{1 + 80}}{2}$

$x = \frac{-9 \pm \sqrt{289}}{2} = 4, \text{ अथवा } -13$

$x = \frac{1 \pm \sqrt{81}}{2} = 5, \text{ अथवा } -4$

(३) $x^2 + 19x = 20$

(७) $x^2 + 9x^2 = -6$

$x = \frac{-19 \pm \sqrt{361 + 80}}{2}$

$x = \frac{-9 \pm \sqrt{81 + 24}}{2}$

$x = \frac{-19 \pm \sqrt{441}}{2}$

$x = \frac{-9 \pm \sqrt{105}}{2} = -9, \text{ अथवा } -6$

$\therefore x = 1, \text{ अथवा } -20$

$\therefore x = -9, \text{ अथवा } -6$

(४) $x^2 - 2x = 8$

(८) $x^2 + 10x - 100 = 0$

$x = \frac{2 \pm \sqrt{4 + 80}}{2}$

$x = \frac{-10 \pm \sqrt{100 + 400}}{2}$

$$\therefore x = \frac{1}{2}(\pm \sqrt{69} - 7)$$

$$x = \pm 3 \text{ अथवा } \sqrt{-18}$$

$$\therefore x = \frac{1}{2}(8x - 7) = \frac{1}{2}(90) \quad x = 11 \quad \sqrt{x} = -10$$

अथवा $-2x$

$$\therefore x = \sqrt{x}, \text{ अथवा } \sqrt{-6x} \quad \therefore \sqrt{x} = \frac{1}{2}(\pm \sqrt{-6x + 9x + 11})$$

$$(9) \quad x^2 + 5x = 92x \quad \therefore \sqrt{x} = \frac{1}{2}(\pm 7 + 11)$$

$$x = \frac{1}{2}(\pm \sqrt{408 + 25 - 4}) \quad \therefore \sqrt{x} = 9 \text{ अथवा } 2$$

$$x = \frac{1}{2}(\pm 23 - 4) = 9 \text{ अथवा } -18 \quad \therefore x = 69 \text{ अथवा } 8$$

$$(99) \quad x^2 - 2x\sqrt{x} = 8 \quad \therefore x = \frac{1}{2}\sqrt{\pm 96 + 9 + 3}$$

$$\therefore x\sqrt{x} = \frac{1}{2}(\pm \sqrt{6x + 9 + 3}) \quad \therefore x = \frac{1}{2}(\pm 5 + 3) = -1 \text{ अथवा } 8$$

$$\therefore x\sqrt{x} = \frac{1}{2}(\pm 5 + 3) = 8 \quad (93) \quad x^2 + 5x = 98x^2$$

अथवा -9 $x^2 + 5x = 98x^2$

$$\therefore x = \sqrt[3]{96} \text{ अथवा } -9 \quad \therefore x = 2 \text{ अथवा } -7$$

$$(92) \quad x^2 - 2x = 22$$

$$(94) \quad \frac{x^2}{x} + \frac{9x}{x} = 20$$

$$\therefore x^2 - 2x = 8$$

$$\therefore \left(\frac{x^2}{x}\right) + 9 - \left(\frac{9x}{x}\right) = 20$$

(१६)

वर्गसमीकरणे

$$\therefore \frac{४अ}{क्ष} = ५ \text{ अथवा } -८$$

$$\therefore क्ष = \frac{४अ}{५} \text{ अथवा } \frac{अ}{२}$$

$$(१५) \frac{१क्ष^२}{४ब^२} - \frac{१५क्ष}{२ब} = ६$$

$$\left(\frac{३क्ष}{२ब}\right)^२ - ५ \times \left(\frac{३क्ष}{२ब}\right) = ६$$

$$\therefore \frac{३क्ष}{२ब} = -१ \text{ अथवा } ६$$

$$क्ष = \frac{-२ब}{३} \text{ अथवा } -४ब$$

$$(१६) क्ष + ५क्ष - \sqrt{क्ष + ५क्ष} = २०$$

$$\therefore \sqrt{क्ष + ५क्ष} = ५ \text{ अथवा } -४$$

$$\therefore क्ष + ५क्ष = २५ \text{ अथवा } १६$$

$$\text{जेव्हा } क्ष + ५क्ष = २५$$

$$\text{तेव्हा } क्ष = \frac{३}{२} (\pm \sqrt{१२५} - ५)$$

$$\text{आणि जेव्हा } क्ष + ५क्ष = १६$$

$$\text{तेव्हा } क्ष = \frac{१}{२} (\pm \sqrt{६९} - ५)$$

$$(१७) क्ष + ३क्ष = २ - \frac{१}{क्ष} - \frac{१}{क्ष}$$

$$\text{क्ष + } \frac{१}{क्ष} + ३क्ष + \frac{१}{क्ष} = २$$

$$\text{क्ष + } २ + \frac{१}{क्ष} + ३\left(\text{क्ष} + \frac{१}{क्ष}\right) = ४$$

$$\therefore \left(\text{क्ष} + \frac{१}{क्ष}\right)^२ + २\left(\text{क्ष} + \frac{१}{क्ष}\right) = ४$$

$$\therefore \text{क्ष} + \frac{१}{क्ष} = १ \text{ अथवा } -४$$

$$\therefore \text{क्ष} + १ = क्ष \text{ अथवा } -४क्ष$$

$$\therefore \text{क्ष} - क्ष = १$$

$$\text{अथवा } \text{क्ष} + ४क्ष = -१$$

$$\therefore \text{क्ष} = \frac{१}{५} (\pm \sqrt{-४ + १६} + २)$$

$$\text{क्ष} = \frac{१}{५} (\pm (१२)^{१/२} + २)$$

(१७)

वर्गसमीकरणें.

दिसऱ्या रूपांतील वर्ग समीकरणें सोडविण्याकरितां सारणी.

$$ड = \frac{1}{2पगु} (\pm \sqrt{४ति \times पगु + (दुगु)^2} - दुगु)$$

(१) ३क्ष + ६क्ष = २४, एथें पगु = ३, दुगु = ६, आणि ति = २४

$$\therefore \text{क्ष} = \frac{1}{2 \times 3} (\pm \sqrt{४ \times २४ \times ३ + (६)^2} - ६)$$

$$= \frac{1}{६} (\pm \sqrt{२८८ + ३६} - ६) = \frac{1}{६} (\pm १८ - ६) = २ \text{ अथवा } -४$$

(२) ५क्ष + ३क्ष = ५४, एथें पगु = ५, दुगु = ३, आणि ति = ५४

$$\therefore \text{क्ष} = \frac{1}{2 \times ५} (\pm \sqrt{४ \times ५४ \times ५ + ३^2} - ३)$$

$$\therefore \text{क्ष} = \frac{1}{१०} (\pm \sqrt{१०८० + ९} - ३) = \frac{1}{१०} (\pm ३३ - ३)$$

$$\therefore \text{क्ष} = ३ \text{ अथवा } -३$$

(३) अक्ष + बक्ष = क, एथें पगु = अ, दुगु = ब, आणि ति = क

$$\therefore \text{क्ष} = \frac{1}{2अ} (\pm \sqrt{४ \times क \times अ + ब^2} - ब)$$

$$\therefore \text{क्ष} = \frac{1}{2अ} (\pm \sqrt{४अक + ब^2} - ब)$$

(४) ८क्ष + १५क्ष = -७, एथें पगु = ८, दुगु = १५, आणि ति = -७

(१८)

वर्गसमीकरणे.

$$\therefore x = \frac{1}{96} (\pm \sqrt{8 \times -17 \times 6 + (19)^2} - 19)$$

$$\therefore x = \frac{1}{96} (\pm \sqrt{-228 + 225 - 19})$$

$$\therefore x = \frac{1}{96} (\pm 1 - 19) = -1 \text{ अथवा } -\frac{2}{3}$$

(५) $3x^2 - 8x = 2 \frac{2}{3}$

$19x^2 - 8x = 19$. एथें $p = 19$, $q = -8$ आणि $r = 19$

$$\therefore x = \frac{1}{39} (\pm \sqrt{8 \times 19 \times 19 + (-8)^2} - (-8))$$

$$\therefore x = \frac{1}{39} (\pm \sqrt{1180 + 16 + 8}) = \frac{1}{39} (\pm 38 + 8)$$

$x = -1$ अथवा $\frac{2}{3}$

(६) $8x^2 - 5x = 6 \frac{1}{2}$

$16x^2 - 5x = 13$. एथें $p = 16$, $q = -5$ आणि $r = 13$

$$\therefore x = \frac{1}{32} (\pm \sqrt{8 \times 16 \times 13 + (-5)^2} - (-5))$$

$$\therefore x = \frac{1}{32} (\pm \sqrt{832 + 25})$$

$x = \frac{1}{32} (\pm 29 + 5) = 2$ अथवा $-\frac{13}{16}$

(१९)

वर्गसमीकरणे.

(१) $३स + ४स = २०$

$\therefore स = \frac{१}{१०} (\pm १० + ३) = २$

$\therefore स = \frac{१}{६} (\pm \sqrt{२४० + १६} - ४)$

अथवा $\frac{१३}{६}$

$\therefore स = \frac{१}{६} (\pm १६ - ४) = २$ अथवा (५) $९स - ८स = -१$

(२) $५स + ६स = ६३$

$\therefore स = \frac{१}{१८} (\pm \sqrt{१०० + ८})$

$\therefore स = \frac{१}{१०} (\pm \sqrt{१२९ + ३६} - ६)$

$\therefore स = \frac{१}{१८} (\pm १० + ८) = १$ अथवा $-\frac{१}{२}$

$\therefore स = \frac{१}{१०} (\pm ३६ - ६)$

(६) $११स - २५स = -१४$

$\therefore स = २$ अथवा $-४\frac{१}{२}$

$\therefore स = \frac{१}{३२} (\pm \sqrt{-६१६ + १६२५ + २५})$

(३) $४स + ७स = ४३$

$\therefore स = \frac{१}{३२} (\pm ३ + २५) = १$ अथवा $\frac{३}{३२}$

$\therefore स = \frac{१}{६} (\pm \sqrt{१४१२ + ४९ - ७})$ (७) $मस + नस = स$

$\therefore स = \frac{१}{२} (\pm ३९ - ७) = ४$

$\therefore स = \frac{१}{३३} (\pm \sqrt{४मस + न - न})$

अथवा $५\frac{३}{४}$

$स = \frac{१}{३३} (\pm \sqrt{४मस + न - न})$

(४) $५स - ३स = १४$

(८) $४(स + ३) + ५(स + ३) = ९$

$\therefore स = \frac{१}{१०} (\pm \sqrt{२८९ + ३})$

$\therefore (स + ३) = \frac{१}{२} (\pm \sqrt{४४ + ३५ - ५})$

(२०)

वर्गसमीकरणं.

$$\therefore (x+2)^2 = \frac{1}{4} (+93-5)$$

$$= 1 \text{ अथवा } -\frac{9}{4}$$

$$\therefore x+2 = 1 \text{ अथवा } \sqrt{\frac{9}{4}}$$

$$\therefore x = -2 \text{ अथवा } -2 + \left(\frac{3}{2}\right)$$

$$\therefore x^2 - 2 = 1 \text{ अथवा } \left(\frac{9}{4}\right)^{\frac{1}{2}}$$

$$\therefore x^2 = 3 \text{ अथवा } = 2 + \left(\frac{9}{4}\right)^{\frac{1}{2}}$$

$$\therefore x = \sqrt{3} \text{ अथवा } \sqrt{2 + \left(\frac{9}{4}\right)^{\frac{1}{2}}}$$

$$(९) \frac{6x^2}{x^2} + \frac{3x}{2x} = \frac{69}{2}$$

$$\therefore \frac{90x^2}{x^2} + \frac{6x}{2x} = 69$$

$$\therefore \frac{x}{x} = \frac{9}{20} (\pm \sqrt{420 + 9 - 2})$$

$$\therefore \frac{x}{x} = \frac{9}{20} (\pm 22 - 2)$$

$$\therefore x = x \text{ अथवा } -\frac{93x}{10}$$

$$(१०) \frac{3}{4} (x^2 - 2)^2 - \frac{5}{2} (x^2 - 2)^{\frac{3}{2}} = -\frac{6}{2}$$

$$\therefore 6(x^2 - 2)^{\frac{3}{2}} + 90(x^2 - 2)^{\frac{3}{2}} = -6$$

$$\therefore (x^2 - 2)^{\frac{3}{2}} = \frac{9}{6} (\pm \sqrt{-28 + 900 + 90})$$

$$\therefore (x^2 - 2)^{\frac{3}{2}} = \frac{9}{6} (\pm 4 + 90)$$

(१)

सोडविषयाकरितां वर्गसमीकरणे.



(१) $\sqrt{x} + 9 = \frac{10}{\sqrt{x}}$ उ० $x = 9$ अथवा $\frac{8}{9}$

(२) $\sqrt{x+9} + \sqrt{x} = 11$ उ० $x = \pm 6$ अथवा $(\pm\sqrt{11})^2$

(३) $\sqrt{x} - \sqrt{x} = 3x$ उ० $x = 8$ अथवा $\sqrt{25}$

(४) $\frac{x^2}{(x-4)^2} + \frac{6}{x-4} = \frac{359}{25x}$ उ० $x = \pm\sqrt{\frac{29}{5}}$ अथवा $\pm\sqrt{\frac{29}{5}}$

(५) $x+8-2\sqrt{\frac{x+8}{x-8}} = \frac{3}{x-8}$ उ० $x = \pm 5$ अथवा $\pm\sqrt{10}$

(६) $x^2 + \sqrt{x^2+5x} = 82-5x$ उ० $x = 8$ अथवा -9

(७) $x + \sqrt{x+6} = 2 + 2\sqrt{x+5}$ उ० $x = 9$ अथवा -2

(८) $9x - 6x^2 + \sqrt{6x^2 - 9x + 99} = 5$ उ० $x = \frac{9}{6} (9 \pm \sqrt{99})$

(९) $\frac{3x+5}{3x-5} - 92 \cdot \frac{3x-5}{3x+5} = 8$ उ० $x = \frac{3}{2}$ अथवा $\frac{5}{2}$

(१०) $\frac{x+92}{x} + \frac{x}{92+x} = 8\frac{3}{4}$ उ० $x^2 = 2$ अथवा $-\frac{1}{2}$

(११) $\frac{2}{(x+2)^2} + \frac{\sqrt{x+2}}{2} = \frac{90}{4(x+2)^2}$ उ० $x = \frac{3}{2}$ अथवा 6

(१२) $x + \sqrt{x} : x - \sqrt{x} :: 3\sqrt{x+5} : 2\sqrt{x}$ उ० x

(१३) $(x+6)^2 + 2\sqrt{x(x+6)} = 926 + 11x$ उ० $x = 8$ अथवा 9

(२)

$$(14) \sqrt{x+1} + \sqrt{x+2} = \frac{x^2+x-4}{\sqrt{x}} \dots \dots \text{उ.स.} = 9 \text{ अथवा } 4$$

$$(15) \sqrt{x^2-12} = \frac{3x}{2} + \sqrt{4x^2+42x} \dots \dots \text{उ.स.} = 2 \text{ अथवा } \frac{93}{2}$$

$$(16) \sqrt{x^2+y^2} = \sqrt{x^2+y^2} \dots \dots \text{उ.स.} = \sqrt{\frac{x^2-y^2}{2x}}$$

$$(17) \frac{\sqrt{x+y}}{x} + \frac{\sqrt{x+y}}{y} = \frac{1}{k} \dots \dots \text{उ.स.} = \frac{xy}{(x+y)^2} - 1$$

$$(18) \sqrt{x+y} + \sqrt{x+y} = \frac{2\sqrt{x+y}}{\sqrt{x+y}} \dots \dots \text{उ.स.} = \pm \frac{2}{\sqrt{x+y}}$$

$$(19) \sqrt{\frac{x}{y}+b} - \sqrt{\frac{x}{y}-b} = b \dots \dots \text{उ.स.} = \pm \frac{2x}{b} \sqrt{\frac{1}{y}}$$

$$(20) \sqrt{x+\frac{3x}{4}} - \sqrt{x-\frac{3x}{4}} = \sqrt{4x} \dots \dots \text{उ.स.} = \sqrt{\frac{4x}{4x-16}}$$

$$(21) \sqrt{\frac{x+y}{x}} + 2\sqrt{\frac{y}{x+y}} = b \sqrt{\frac{x+y}{x}} \dots \dots \text{उ.स.} = \frac{xy}{(b-1)^2}$$

$$(22) \frac{y-\sqrt{y^2-x^2}}{x+\sqrt{y^2-x^2}} = b \dots \dots \text{उ.स.} = \pm \frac{2xy}{y+x}$$

$$(23) \frac{y-\sqrt{y^2+16}}{x+\sqrt{y^2+16}} = \frac{y}{x} \dots \dots \text{उ.स.} = -15 \text{ अथवा } 28$$

$$(24) \frac{4x^2+96x}{15} + \frac{5x^2-x^3}{x+x} = \frac{4x^2}{99}$$

$$(25) \frac{(1+x^2)}{(1+x)^2} = \frac{1}{2} \dots \dots \text{उ.स.} = \sqrt{3-2\sqrt{3}} - (1\pm\sqrt{3})$$

$$(26) \frac{x}{2x+3} + \frac{3x+6}{5x+10} = \frac{3x+6}{5x} \dots \dots \text{उ.स.} = 6 \text{ अथवा } -22\frac{1}{2}$$

$$(27) \frac{1}{x+5x} + \frac{10x-10}{2+4x} = \frac{4x+2}{2x+12}$$

(३)

$$(२८) \frac{x}{x} + \frac{x}{x} = \frac{x-1}{x} + \frac{x}{2} + \frac{x}{2}$$

• मागे सोडविण्याकरिता दिलेल्यां वर्गसमीकरणां एथें सोडविलीं आहेत.

$$(१) \frac{x}{x^2} + 9 = \frac{90}{x\sqrt{x}}$$

$$\therefore \sqrt{x} = \pm 2 \text{ अथवा } \pm \sqrt{-11}$$

$$x(\frac{1}{x}) - 90(\frac{1}{x\sqrt{x}}) = 9$$

$$\therefore x = \pm 9 \text{ अथवा } (\pm\sqrt{-11})^2$$

$$x(\frac{1}{x\sqrt{x}}) - 90(\frac{1}{x\sqrt{x}}) = 9 \quad (२) \sqrt{x} - \frac{90}{\sqrt{x}} = 9x$$

$$\frac{1}{x\sqrt{x}} - \frac{1}{9x} (\pm\sqrt{-22+22+90}) \quad \sqrt{x} - \frac{90}{\sqrt{x}} = \frac{9x}{\sqrt{x}}$$

$$\frac{1}{x\sqrt{x}} - \frac{1}{9x} (\pm 1+90) = 9 \text{ अथवा } \frac{1}{2}$$

$$\therefore x - \frac{90}{\sqrt{x}} = \frac{90}{\sqrt{x}}$$

$$\therefore x = 9 \text{ अथवा } \frac{80}{9}$$

$$\therefore x = \frac{1}{2} (\pm\sqrt{\frac{160}{x} + \frac{80}{x}} + \frac{90}{\sqrt{x}})$$

$$(२) x\sqrt{x} + 9\sqrt{x} = 88$$

$$\therefore x = \frac{1}{2} (\pm\sqrt{160} + \sqrt{80})$$

$$\therefore \sqrt{x} + 9\sqrt{x} = 88$$

$$\therefore x = \sqrt{88} \text{ अथवा } \sqrt{88}$$

$$\sqrt{x} = \frac{1}{2} (\pm\sqrt{900+88-9})$$

$$\therefore x\sqrt{x} = 8 \text{ अथवा } -9$$

$$\therefore \sqrt{x} = \frac{1}{2} (\pm 95-9) = 4 \text{ अथवा } -11$$

$$\therefore x = 8 \text{ अथवा } \sqrt{24}$$

(४)

$$(४) \frac{x^2}{(x-4)^2} + \frac{4}{x-4} = \frac{359}{25x^2} \quad \therefore x+4 = \frac{4}{x-4} \text{ अथवा } \frac{9}{x-4}$$

$$\frac{9}{(x-4)^2} + \frac{4}{x-4} \times \frac{9}{x-4} = \frac{359}{25x^2} \quad \therefore x^2 - 16 = 9 \text{ अथवा } 9$$

$$\frac{9}{x-4} = \pm \sqrt{\frac{359}{25x^2} + \frac{4}{x-4}} - \frac{4}{x-4} \quad \therefore x^2 = 25 \text{ अथवा } 9$$

$$\therefore \frac{9}{x-4} = \pm \frac{24}{5x^2} - \frac{4}{x-4} \quad \therefore x = \pm 5 \text{ अथवा } \pm \sqrt{9}$$

$$\therefore \frac{9}{x-4} = \frac{4}{5x^2} \text{ अथवा } \frac{39}{5x^2} \quad (६) x^2 + \sqrt{x^2+5x} = 42 - 5x$$

$$\text{जहाँ } \frac{9}{x-4} = \frac{4}{5x^2} \quad \therefore x^2 + 5x + \sqrt{x^2+5x} = 42$$

$$\therefore 5x^2 = 4x^2 - 36 \quad \therefore \sqrt{x^2+5x} = 6 \text{ अथवा } 10$$

$$\therefore 5x^2 = 4x^2 - 36 \quad \therefore x^2 + 5x = 36 \text{ अथवा } 49$$

$$\text{आणि जहाँ } \frac{9}{x-4} = \frac{39}{5x^2} \quad \text{जहाँ } x^2 + 5x = 36$$

$$\therefore x = \pm \sqrt{\frac{39}{11}} \quad \text{तेहाँ } x = 4 \text{ अथवा } -9$$

$$(५) x+4 - 2\sqrt{\frac{x+4}{x-4}} = \frac{3}{x-4} \quad \text{आणि जहाँ } x^2 + 5x = 49$$

$$\frac{x+4}{x-4} - \frac{2}{x-4} \sqrt{\frac{x+4}{x-4}} = \frac{3}{(x-4)^2} \quad \text{तेहाँ } x = \frac{9}{2} (\pm \sqrt{221} - 4)$$

$$\therefore \sqrt{\frac{x+4}{x-4}} = \frac{3}{x-4} \text{ अथवा } \frac{9}{x-4} \quad (७) x + \sqrt{x+5} = 2 + 3\sqrt{x+5}$$

$$\frac{x+4}{x-4} = \frac{9}{(x-4)^2} \text{ अथवा } \frac{9}{(x-4)^2} \quad \therefore x - 2\sqrt{x+5} = 2$$

(५)

$$x+5-2\sqrt{x+5}=6$$

$$\therefore \sqrt{x+5} = -2 \text{ अथवा } 8$$

$$\therefore x+5 = 4 \text{ अथवा } 64$$

$$\therefore x = -2 \text{ अथवा } 59$$

$$\therefore \frac{3x+5}{3x-5} = -2 \text{ अथवा } 6$$

$$\text{जेव्हा } \frac{3x+5}{3x-5} = -2$$

$$\text{तेव्हा } x = \frac{5}{2}$$

$$\text{आणि जेव्हा } \frac{3x+5}{3x-5} = 6$$

(८) $9x - 4\sqrt{x} + \sqrt{4x^2 - 9x + 11} = 5$

$$4\sqrt{x^2 - 9x + 11} - \sqrt{4x^2 - 9x + 11} = -4 \quad (90) \quad \frac{x+12}{x} + \frac{x}{x+12} = \frac{49}{8}$$

$$(4\sqrt{x^2 - 9x + 11}) - \sqrt{4x^2 - 9x + 11} = -4 \quad \therefore \frac{x+12}{x} + 2 + \frac{x}{x+12} = \frac{49}{8}$$

$$\sqrt{4x^2 - 9x + 11} = 3 \text{ अथवा } -2$$

$$\therefore 4x^2 - 9x + 11 = 9 \text{ अथवा } 4$$

$$\therefore 4x^2 - 9x = -2 \text{ अथवा } -7$$

$$\text{आणि } \frac{x+12}{x} - 2 + \frac{x}{x+12} = \frac{9}{8}$$

$$\therefore \frac{\sqrt{x+12}}{\sqrt{x}} + \frac{\sqrt{x}}{\sqrt{x+12}} = \frac{4}{2}$$

$$\frac{\sqrt{x+12}}{\sqrt{x}} - \frac{\sqrt{x}}{\sqrt{x+12}} = \frac{3}{2}$$

(९) $\frac{3x+5}{3x-5} - 12 \cdot \frac{3x-5}{3x+5} = 8$

$$\frac{3x+5}{3x-5} \text{ यांचे गुणून}$$

$$\left(\frac{3x+5}{3x-5}\right)^2 - 12 = 8 \cdot \frac{3x+5}{3x-5}$$

$$\left(\frac{3x+5}{3x-5}\right)^2 - 8 \left(\frac{3x+5}{3x-5}\right) = 12$$

$$\therefore 2 \frac{\sqrt{x+12}}{\sqrt{x}} = \frac{6}{2} = 3$$

$$\therefore \frac{\sqrt{x+12}}{\sqrt{x}} = 2$$

$$\therefore \frac{x+12}{x} = 4 \quad \therefore x = 4$$

(११) $\frac{2}{(x+2)^2} + \frac{\sqrt{x+2}}{2} = \frac{10}{2(x+2)^2}$

(६)

$$\frac{2}{(x+2)} + \frac{x-2}{2} = \frac{9}{8}$$

$$\frac{9}{x+2} + \frac{x+2}{8} = \frac{9}{8}$$

$\frac{9}{x+2}$ यानें गुणून

$$\left(\frac{9}{x+2}\right)^2 + \frac{9}{8} = \frac{9}{8} \left(\frac{9}{x+2}\right)$$

$$\therefore \left(\frac{9}{x+2}\right)^2 - \frac{9}{8} \left(\frac{9}{x+2}\right) = -\frac{9}{8}$$

(१२) $x+\sqrt{x} : x-\sqrt{x} :: 3\sqrt{x}+5 : 2\sqrt{x}$

$$\therefore 2x : 2\sqrt{x} :: 5\sqrt{x}+5 : \sqrt{x}+5$$

$$\therefore \sqrt{x} : 1 :: 5\sqrt{x}+5 : \sqrt{x}+5$$

$$\therefore x+5\sqrt{x} = 5 : x+5$$

$$\therefore x+\sqrt{x} = 5 : \sqrt{x} = 2 \text{ अथवा } 3$$

$$\therefore x = 4 \text{ अथवा } 9$$

(१३) $(x+6)^2 + 2\sqrt{x}(x+6) = 92 + \sqrt{x}$

$$(x+6)^2 + 2\sqrt{x}(x+6) + x - 2\sqrt{x}(x+6) - x = 92 + \sqrt{x} - x$$

$$\therefore (x+6+\sqrt{x})^2 = x+6+\sqrt{x}+92$$

$$\therefore (x+6+\sqrt{x})^2 - (x+6+\sqrt{x}) = 92$$

$$x+6+\sqrt{x} = 92 \text{ अथवा } 92$$

$$\therefore x+\sqrt{x} = -92 \text{ अथवा } -6$$

$$\text{जर } x+\sqrt{x} = 6, \text{ तर } \sqrt{x} = 2 \text{ अथवा } 3$$

$$\text{आणि जर } x+\sqrt{x} = -92$$

$$\text{तर } \sqrt{x} = \frac{1}{2} (\pm \sqrt{-67-9})$$

(१४) $x+\sqrt{x}+2 = \frac{x^2+x-8}{\sqrt{x}}$

$$\therefore x+\sqrt{x}+2 = \frac{x^2-8}{\sqrt{x}} + \sqrt{x}$$

$$\therefore x+2 = \frac{x^2-8}{\sqrt{x}} = \frac{(x+2)(x-2)}{\sqrt{x}}$$

$$\therefore 9 = \frac{x-2}{\sqrt{x}} \therefore x-\sqrt{x} = 2$$

$$\therefore \sqrt{x} = 1 \text{ अथवा } 2 \therefore x = 1 \text{ अथवा } 4$$

$$\therefore \frac{1}{x+2} = 2 \text{ अथवा } \frac{1}{2}$$

$$\therefore x+2 = \frac{1}{2} \text{ अथवा } -1$$

$$\therefore x = -1\frac{1}{2} \text{ अथवा } -10$$

(6)

$$(94) \sqrt{a^2 + b^2} = \sqrt{c^2 + d^2}$$

$$a + b = \sqrt{c^2 + d^2}$$

$$\therefore a + b + 2ab = c^2 + d^2$$

$$\therefore 2ab = c^2 - a^2$$

$$\therefore b = \pm \sqrt{\frac{c^2 - a^2}{2a}}$$

$$(95) \frac{\sqrt{a+b}}{b} + \frac{\sqrt{a+b}}{a} = \frac{\sqrt{b}}{c}$$

$$\sqrt{a+b} \left(\frac{1}{b} + \frac{1}{a} \right) = \frac{\sqrt{b}}{c}$$

$$\sqrt{a+b} \left(\frac{a+b}{ab} \right) = \frac{\sqrt{b}}{c}$$

$$\therefore (a+b)^{\frac{3}{2}} = \frac{ab\sqrt{b}}{c}$$

$$(a+b)^3 = \left(\frac{ab}{c} \right)^2 \cdot b^3$$

$$a+b = \left(\frac{ab}{c} \right)^{\frac{2}{3}} \cdot b$$

$$\therefore a = \frac{ab}{(c^2)^{\frac{2}{3}} - b^2}$$

$$(96) b + \sqrt{a^2 + b^2} = \frac{2a^2}{\sqrt{a^2 + b^2}}$$

$$b \sqrt{a^2 + b^2} + a^2 + b^2 = 2a^2$$

$$b \sqrt{a^2 + b^2} = a^2 - b^2$$

$$a^2 + b^2 = a^2 - 2ab + b^2$$

$$2ab = 0 \therefore b = \frac{a^2}{2}$$

$$\therefore b = \pm \frac{a}{\sqrt{2}}$$

$$(97) \sqrt{\frac{a}{b^2 + c^2}} - \sqrt{\frac{a}{b^2} + c^2} = b$$

$$\therefore \sqrt{\frac{a}{b^2 + c^2}} = b + \sqrt{\frac{a}{b^2} + c^2}$$

$$\frac{a}{b^2 + c^2} = b^2 + \frac{a}{b^2} + 2b \sqrt{\frac{a}{b^2} + c^2}$$

$$\therefore 0 = b^2 + 2b \sqrt{\frac{a}{b^2} + c^2}$$

$$\therefore \sqrt{\frac{a}{b^2} + c^2} = \frac{b}{2}$$

$$\frac{a}{b^2} + c^2 = \frac{b^2}{4} \therefore \frac{a}{b^2} = \frac{b^2}{4} - c^2$$

$$b^2 = \frac{4a}{\frac{b^2}{4} - c^2} \therefore b = \pm \frac{2\sqrt{a}}{\sqrt{\frac{b^2}{4} - c^2}}$$

$$(98) \sqrt{b^2 + 2a} - \sqrt{b^2 - 2a} = \sqrt{ab}$$

(C)

$$\therefore x^2 + \frac{3a^2}{4L} - 2\sqrt{x^2 - \frac{9a^2}{9L}} + x^2 - \frac{3a^2}{4L} = ax^2$$

$$2x^2 - 2\sqrt{x^2 - \frac{9a^2}{9L}} = ax^2 \therefore 2\sqrt{x^2 - \frac{9a^2}{9L}} = 2x^2 - ax^2$$

$$4x^2 - \frac{9a^2}{L} = 4x^2 - 4ax^2 + ax^2 \therefore \frac{9a^2}{L} = -4ax^2 + ax^2$$

$$\therefore x^2(4a - a) = \frac{9a^2}{L} \therefore x^2 = \frac{9a^2}{9L - 4a} = \frac{9a}{9L - 4a}$$

$$\therefore x = \frac{3\sqrt{a}}{2\sqrt{9L - 4a}} \quad y = \frac{\sqrt{3}\sqrt{a}}{\sqrt{2}\sqrt{9L - 4a}}$$

(10) $\sqrt{\frac{x+a}{x}} + 2\sqrt{\frac{a}{x+a}} = 3\sqrt{\frac{x}{x+a}}$

$\sqrt{\frac{x+a}{x}}$ यात्रे गुणून $\frac{x+a}{x} + \frac{2\sqrt{a}}{\sqrt{x}} = 3$

$$\therefore 1 + \frac{a}{x} + \frac{2\sqrt{a}}{\sqrt{x}} = 3 \therefore 1 + \frac{\sqrt{a}}{\sqrt{x}} = 2 \therefore \frac{\sqrt{a}}{\sqrt{x}} = 1 \therefore \sqrt{x} = \sqrt{a}$$

$$\therefore \sqrt{x} = \frac{\sqrt{a}}{1+b} \therefore x = \frac{a}{(1+b)^2}$$

(11) $\frac{a - \sqrt{a^2 - x^2}}{a + \sqrt{a^2 - x^2}} = b \therefore a - \sqrt{a^2 - x^2} = ab + b\sqrt{a^2 - x^2}$

$$\therefore \sqrt{a^2 - x^2} - b\sqrt{a^2 - x^2} = a - ab = a(1-b)$$

$$\sqrt{a^2 - x^2}(1-b) = a(1-b) \therefore \sqrt{a^2 - x^2} = \frac{a(1-b)}{1-b}$$

$$a^2 - x^2 = \frac{a^2(1-b)^2}{(1-b)^2} \therefore x^2 = a^2 - \frac{a^2(1-b)^2}{(1-b)^2} = a^2 \left(1 - \frac{(1-b)^2}{(1-b)^2}\right)$$

$$\therefore x = \pm a \sqrt{1 - \frac{(1-b)^2}{(1-b)^2}} = \pm \frac{a}{1+b} \sqrt{(1+b)^2 - (1-b)^2}$$

(९)

$$क्ष = \pm \frac{अ}{१+ब^२} \times \sqrt{४ब^२} = \pm \frac{२अब}{१+ब^२}$$

$$२) \frac{क्ष+\sqrt{क्ष+१६}}{क्ष-\sqrt{क्ष+१६}} = \frac{९}{७} \therefore \frac{२\sqrt{क्ष+१६}}{२क्ष} = \frac{१}{१५}$$

$$\therefore \frac{\sqrt{क्ष+१६}}{क्ष} = \frac{१}{१५} \therefore १५\sqrt{क्ष+१६} = क्ष$$

$$\therefore १५\sqrt{क्ष+१६} + १६ = क्ष + १६ \therefore (क्ष+१६) - १५\sqrt{क्ष+१६} = १६$$

$$\therefore \sqrt{क्ष+१६} = १६ \text{ अथवा } -\frac{१६}{१५} \therefore क्ष+१६ = २५६ \text{ अथवा } \frac{२५६}{२२५}$$

$$\therefore क्ष = २४० \text{ अथवा } १५ \frac{५५}{६४}$$

$$३) \frac{४क्ष^२+१७क्ष}{१९} + \frac{५क्ष-क्ष^२}{३+क्ष} = \frac{४क्ष^२}{१९}$$

$$\frac{४क्ष^२}{१९} + \frac{१७क्ष}{१९} + \frac{५क्ष-क्ष^२}{३+क्ष} = \frac{४क्ष^२}{१९}$$

$$\therefore \frac{१७क्ष}{१९} + \frac{५क्ष-क्ष^२}{३+क्ष} = 0 \therefore \frac{१७}{१९} = \frac{५-क्ष^२}{३+क्ष}$$

$$५१+१७क्ष = १५-१९क्ष^२ \therefore १९क्ष^२+१७क्ष = ४४$$

$$\therefore क्ष = \frac{१}{३०} \left(\pm \sqrt{४४ \times १९ + (१७)^2 - १७} \right)$$

$$) \frac{(१+क्ष^२)}{(१+क्ष)^२} = \frac{१}{४} \therefore \frac{१+क्ष^२}{१+४क्ष+६क्ष^२+४क्ष^३+क्ष^४} = \frac{१}{४}$$

$$४+४क्ष^३ = १+४क्ष+६क्ष^२+क्ष^४ \therefore ३+३क्ष^३ = ४क्ष+६क्ष^२+४क्ष^३$$

$$१+४क्ष^३ = \frac{४}{३}क्ष+२क्ष^२+\frac{४}{३}क्ष^३ \therefore १+क्ष^३+२क्ष^२ = \frac{४क्ष}{३} + ४क्ष^३ + \frac{४}{३}क्ष^३$$

(१०)

$$\therefore (1+x^2)^2 = \frac{8}{9} x(1+x^2) + 8x^2$$

$$(1+x^2)^2 - \frac{8}{9} x(1+x^2) = 8x^2$$

$$(1+x^2)^2 - \frac{8}{9} x(1+x^2) + \frac{8}{9} x^2 = 8x^2 + \frac{8}{9} x^2 = \frac{80x^2}{9}$$

$$\therefore 1+x^2 - \frac{2x}{3} = \pm \frac{2x}{3} \sqrt{10} \therefore x^2 - \frac{2x}{3} (1 \pm \sqrt{10}) = 1$$

$$\therefore 3x^2 - 2x(1 \pm \sqrt{10}) = 3 \therefore x =$$

$$(24) \frac{8}{2x+3} + \frac{3x+6}{4x+9} = \frac{2x+5}{4x}$$

$$\frac{20}{2x+3} + \frac{12x+18}{4x+9} = \frac{12x+24}{4x} = \frac{12x}{4x} + \frac{24}{4x}$$

$$\frac{20}{2x+3} + \frac{3(4x+9)-24}{4x+9} = 3 + \frac{5}{x}$$

$$\frac{20}{2x+3} + 3 - \frac{24}{4x+9} = 3 + \frac{5}{x} \therefore \frac{20}{2x+3} - \frac{24}{4x+9} = \frac{5}{x}$$

$$\frac{4}{2x+3} - \frac{6}{4x+9} = \frac{5}{x} \therefore \frac{4(4x+9) - 6(2x+3)}{(2x+3)(4x+9)} = \frac{5}{x}$$

$$\frac{16x+36}{(2x+3)(4x+9)} = \frac{5}{x} \therefore 16x^2 + 20x + 36 = 5(8x^2 + 30x + 27)$$

$$16x^2 + 20x + 36 = 40x^2 + 150x + 135 \therefore x = \frac{1}{4} (\pm \sqrt{2950 + 9009 - 32})$$

$$\therefore x = \frac{1}{4} (\pm \sqrt{3209 - 32}) = \frac{1}{4} (\pm 57 - 32) = 5 \text{ अथवा } -12\frac{1}{4}$$

$$(25) \frac{0}{1+4x} + \frac{0x-10}{2+8x} = \frac{8x+3}{2x+12}$$

(११)

$$\frac{१६}{९+५६} + \frac{८६-१७}{१+२६} = \frac{८६+६}{२६+१२} = \frac{८६-१७}{२६+१२} + \frac{२३}{२६+१२}$$

$$\therefore \frac{८६-१७}{१+२६} - \frac{८६-१७}{२६+१२} = \frac{२३}{२६+१२} - \frac{१६}{९+५६}$$

$$(८६-१७) \left(\frac{१}{१+२६} - \frac{१}{२६+१२} \right) = \frac{२३}{२६+१२} - \frac{१६}{९+५६}$$

$$(८६-१७) \left(\frac{२६+१२-(१+२६)}{(१+२६)(२६+१२)} \right) = \frac{२३(९+५६) - १६(२६+१२)}{(२६+१२)(९+५६)}$$

$$\frac{(८६-१७) \times ११}{(१+२६)(२६+१२)} = \frac{१७५-७७६}{(२६+१२)(९+५६)} \therefore \frac{११(८६-१७)}{१+२६} = \frac{१७५-७७६}{९+५६}$$

$$११(८६-१७)(९+५६) = (१७५-७७६)(१+२६)$$

$$४४०६ - १४३६ - १६८२ = -१५४६ - ४९७६ + १९२५$$

$$\therefore ५९४६ + ३५४६ = २६०८ \therefore ६ = २०१९$$

$$(२७) \frac{४}{६} + \frac{४}{६} = \frac{अ-१}{६} + \frac{अ}{२} + \frac{अ}{२}$$

$$\therefore \frac{४}{६} + \frac{४}{६} + \frac{१}{६} = \frac{अ}{६} + \frac{अ}{२} + \frac{अ}{२}$$

$$\therefore \frac{४}{६} + \frac{४}{६} + \frac{१}{६} = \frac{अ}{६} + \frac{अ}{२} + \frac{अ}{२}$$

$$\left(\frac{४}{६} + \frac{१}{६} \right)^२ = \frac{अ}{२} \left(\frac{४}{६} + \frac{१}{६} \right) + \frac{अ}{२}$$

$$\left(\frac{४}{६} + \frac{१}{६} \right)^२ \frac{अ}{२} \left(\frac{४}{६} + \frac{१}{६} \right) + \frac{अ}{१६} = \frac{अ}{२} + \frac{अ}{१६} = \frac{९अ}{१६}$$

$$\therefore \left(\frac{४}{६} + \frac{१}{६} \right) - \frac{अ}{४} = \pm \frac{३अ}{४}$$

(१२)

$$\therefore \frac{2}{x^2} + \frac{9}{x} = a \text{ अथवा } -\frac{a}{2}$$

$$\frac{9}{x} = \frac{9}{8} \left(\pm \sqrt{4a+9-9} \right) \text{ अथवा } \frac{9}{8} \left(\pm \sqrt{-4a+9-9} \right)$$

$$\therefore x = \frac{8}{\pm \sqrt{4a+9-9}} \text{ अथवा } \frac{8}{\pm \sqrt{-4a+9-9}}$$

$$(१५) \quad \begin{aligned} 2x^2 - 99 &= \frac{3x}{2} + \sqrt{6x^2 + 52x^2} \\ &= \frac{3x}{2} + x\sqrt{6x+52} \end{aligned}$$

$$\therefore 32x^2 - 52 = 6x + 8x\sqrt{6x+52} \text{ चारीनें गुणन}$$

$$\text{स्थलांतराने } 52 + 6x + 8x\sqrt{6x+52} = 32x^2$$

$$(52 + 6x) + 8x\sqrt{6x+52} + 8x^2 = 32x^2$$

$$\text{वर्गमूलकाहून } \sqrt{6x+52} + 2x = \pm 6x$$

$$\therefore \sqrt{6x+52} = \pm 6x - 2x = 4x \text{ अथवा } -4x$$

$$\therefore 6x+52 = 16x^2 \text{ अथवा } 16x^2$$

$$\text{जेकां } 6x+52 = 16x^2 \text{ तेकां } x = 2 \text{ अथवा } -\frac{13}{8}$$

$$\text{आणि जेकां } 6x+52 = 16x^2 \text{ तेकां } x = \frac{1}{8} \left(\pm \sqrt{3796+9} \right)$$

(१)

एक अक्षरीसमीकरणें.

- (१) $\sqrt{क्ष+अ} + \sqrt{क्ष-अ} = ब \dots$ उत्तर $क्ष = \frac{४अ + ब^२}{४ब}$
- (२) $\sqrt{१-क्ष^२} = अ(१+क्ष) \dots$ उ० $क्ष = \frac{\{ \pm (\sqrt{अ+१}) - (२अ+१) \}}{२अ}$
- (३) $\sqrt{अ+क्ष} + \sqrt{अ-क्ष} = २ब \dots$ उ० $क्ष = \pm \sqrt{२ब} \sqrt{अ-ब}$
- (४) $\sqrt{१+क्ष+क्ष^२} = अ - \sqrt{१-क्ष+क्ष^२} \dots$ उ० $क्ष = \pm \frac{अ}{२} \sqrt{\frac{अ-४}{अ-१}}$
- (५) $\frac{अक्ष-१}{\sqrt{अक्ष+१}} = ४ + \frac{\sqrt{अक्ष-१}}{२} \dots$ उ० $क्ष = \frac{८}{अ}$ अथवा $\frac{१}{अ}$
- (६) $\frac{अ-क्ष + \sqrt{२अक्ष-क्ष^२}}{अ-क्ष} = ब \dots$ उ० $क्ष = अ - \frac{अ}{\sqrt{(ब-१)+१}}$
- (७) $\frac{अ+क्ष + \sqrt{अ+२अक्ष}}{अ+क्ष - \sqrt{अ+२अक्ष}} = ब \dots$ उ० $क्ष = \frac{२अ+ब}{(१+ब-१)}$
- (८) $\frac{अ+क्ष + \sqrt{अ+क्ष^२}}{अ+क्ष - \sqrt{अ+क्ष^२}} = ब \dots$ उ० $क्ष = अ \frac{\sqrt{१-(ब+१)^२}}{\sqrt{१-(ब+१)^२}}$
- (९) $क्ष - \frac{२}{\sqrt{क्ष}} = १ \dots$ उ० $\sqrt{क्ष} = -१$ अथवा २

(27)

(90) $\frac{\sqrt{a^2+x^2}-a}{\sqrt{a^2-x^2}+a} = b \dots \dots$ उत्तर $x = \pm \frac{2ab\sqrt{1-b^2}}{1+b^2}$

(91) $x^2+1=0 \dots \dots \dots$ उ० $x = \pm \sqrt{-1} = \pm \sqrt{-1}$

(92) $\frac{4x+17}{x+4} + \frac{3x-13}{x-4} = \frac{10x+40}{2x+7} + \frac{10x+9}{5x+4} \dots \dots$ उ० $x = 11$
अथवा $\pm \sqrt{11-26}$

(93) $x+4 + \sqrt{\frac{x+4}{x-4}} = \frac{12}{x-4} \dots \dots$ उ० $x = 4$ अथवा 4 अथवा 4

(94) $\frac{a+x}{(a+x)^2} = b \dots \dots \dots$ उ० $x = \frac{a}{2} (m + \sqrt{m^2-4})$ जहाँ $m = \frac{2b \pm \sqrt{2(b+1)}}{1-b}$

(95) $\sqrt{(a+x)^2-2} \sqrt{(a-x)^2} = \sqrt{a^2-x^2} \dots \dots$ उ० $x = \frac{31a}{23}$

(96) $(a+x)^{\frac{2}{3}} + 4(a-x)^{\frac{2}{3}} = 5(a^{\frac{2}{3}}) \dots \dots$ उ० $x = \frac{63a}{65}$

(97) $\sqrt{1+x} + \sqrt{1-x} = \sqrt{2} \dots \dots$ उ० $x = 1$ अथवा 1 अथवा 0

(98) $\sqrt{1-x+x^2} = \sqrt{x} + \sqrt{1+x+x^2} \dots \dots$ उ० $x = 0$ अथवा $\pm \sqrt{-1}$

(99) $x^2 - \frac{2}{x} = 1 \dots \dots \dots$ उ० $x = \frac{2}{3}$ अथवा $\frac{2}{3} (1 \pm \sqrt{10})$

(20) $x^2 + \frac{1}{x} = 2\sqrt{11} - \frac{1}{x} \dots \dots$ उ० $x = \frac{1}{2} (11 + 3\sqrt{33})$

(21) $\frac{a+x - \sqrt{a^2-x^2}}{a+x + \sqrt{a^2-x^2}} = \frac{b}{x} \dots \dots$ उ० $x = \pm 2ab\sqrt{a-b^2}$

(3)

$$(22) \frac{a - \sqrt{2ax - x^2}}{a + \sqrt{2ax - x^2}} = \frac{x}{a-x} \dots \dots \dots \text{उ० क्ष} = a \text{ अथवा } \frac{a}{x}$$

$$(23) \frac{a+x}{\sqrt{a-x}} + \frac{a-x}{\sqrt{a+x}} = 2\sqrt{a} \dots \dots \dots \text{उ० क्ष} = \pm a (\pm \sqrt{2-1})^{\frac{2}{3}}$$

$$(24) \frac{243 + 324\sqrt{3}x}{96x-3} = (4\sqrt{3}x - \sqrt{3})^3 \dots \dots \dots \text{उ० क्ष} = \frac{3}{96} \text{ अथवा } 3$$

$$(25) \frac{(1+x^2)}{(1+x)^2} + \frac{(1-x^2)}{(1-x)^2} = a \dots \dots \dots \text{उ० क्ष} = \frac{\pm \sqrt{a+1} - \sqrt{3}}{\sqrt{a-2}}$$

$$(26) \frac{(1+x^2)^2}{(1+x)^3} + \frac{(1-x^2)^2}{(1-x)^3} = b \dots \dots \dots \text{उ० क्ष} = \pm \sqrt{\frac{b-2}{b}}$$

$$(27) \frac{2a\sqrt{1+x^2}}{1-x+\sqrt{1+x^2}} = a+b \dots \dots \dots \text{उ० क्ष} = \frac{\pm \sqrt{(a+b)^2 + 4ab} - (a-b)}{\pm \sqrt{(a+b)^2 + 4ab} + (a-b)}$$

$$(28) x^2(x+a) + b(x+a) = b - (x+2b) \dots \dots \dots \text{उ० क्ष} = -b \text{ अथवा } \frac{1}{2} (\pm \sqrt{a^2 - 4b})$$

$$(29) \frac{1+x^2}{(1+x)^2} + \frac{1-x^2}{(1-x)^2} = a \dots \dots \dots \text{उ० क्ष} = \pm \sqrt{\frac{a-2}{a+4}}$$

$$(30) \sqrt{(1+x)^2 - ax} + \sqrt{(1-x)^2 + ax} = x \dots \dots \dots \text{उ० क्ष} = \pm \sqrt{\frac{1}{3} (8a^2 - 9ax + 9a)}$$

$$(31) \sqrt{x - \frac{6}{x}} = \frac{3}{\sqrt{x-2}} \dots \dots \dots \text{उ० क्ष} = 96 \text{ अथवा } 9$$

$$(32) \frac{x + \sqrt{x^2 - a^2}}{x - \sqrt{x^2 - a^2}} = \frac{x}{a} \dots \dots \dots \text{उ० क्ष} = \frac{a}{2} (\pm \sqrt{3-1})$$

(४)

$$(33) \sqrt{1+a} \cdot \sqrt{1-b} - \sqrt{1-a} \cdot \sqrt{1+b} = 2a \dots \text{उ० क्ष} = a$$

अथवा $a - b a^2$

$$(34) \frac{a}{a+b} + \frac{a}{\sqrt{a+b}} = \frac{2a^2}{b} \dots \text{उ० क्ष} = \frac{1}{2} a (a \pm \sqrt{a^2 + a})$$

अथवा $2a (a \pm \sqrt{a^2 + a})$

$$(35) a + b + 3\sqrt{ab} = b \dots \text{उ० क्ष} = (\sqrt{b} - \sqrt{a})^2$$

$$(36) a + (b + \sqrt{ab})\sqrt{a} = (b - \sqrt{ab})\sqrt{2a+b} \dots \text{उ० क्ष} = \frac{(\sqrt{2ab} - \sqrt{a})^2}{2\sqrt{2b}}$$

$$(37) \frac{1}{\sqrt{a^2+1+a}} + \frac{1}{\sqrt{a^2-1-a}} = \sqrt{a^2-1} - 2a \dots \text{उ० क्ष} = \frac{\pm \sqrt{3}}{4}$$

$$(38) a + b + \sqrt{2ab+a^2} = \sqrt{ab-a^2} + \sqrt{2a^2-ab-a^2}$$

उ० क्ष = $\frac{(12+1)a}{2\sqrt{2}}$

$$(39) \sqrt{(1+a)^2 + (1-a)a} + \sqrt{(1-a)^2 + (1+a)a} = 2a$$

उ० क्ष = 0 अथवा 4

$$(40) \frac{1 + \sqrt{a^2-1}}{1+2a\sqrt{a^2-1}} = \frac{\sqrt{a^2-1}-1}{a^2-2} \dots \text{उ० क्ष} = \pm \sqrt{1+4(a-1)^2}$$

(५)

$$(४१) \frac{(१+क्ष)+\sqrt{२क्ष+क्ष^२}}{(१+क्ष)-\sqrt{२क्ष+क्ष^२}} = १-अक्ष$$

$$(४२) ४\{(क्ष^२-१६)^{३/२}+८\} = क्ष^३+१६(क्ष^२-१६)^{३/२} \dots \text{उ० क्ष} = \pm ४\sqrt{२}$$

$$(४३) \frac{१}{\sqrt{१-क्ष+१}} + \frac{१}{\sqrt{१+क्ष-१}} = \frac{१}{क्ष} \dots \text{उ० क्ष} = \pm \frac{१}{२}\sqrt{१३}$$

$$(४४) २क्ष(१-क्ष^२)^{३/२} = अ(१+क्ष^२)$$

$$(४५) \left(\frac{२क्ष+३}{२क्ष-३}\right)^{३/२} + \left(\frac{२क्ष-३}{२क्ष+३}\right)^{३/२} = \frac{१६}{१३} \left(\frac{४क्ष^२+९}{४क्ष^२-९}\right) \text{ उ० क्ष} = \pm \frac{३}{२}\sqrt{१-१}$$

$$\text{क्ष} = १ \frac{१३}{१४}$$

$$(४६) \frac{\sqrt{१+अ^२}-अ\sqrt{१+क्ष^२}}{\sqrt{१+क्ष^२}-क्ष\sqrt{१+अ^२}} = अ \dots \text{उ० क्ष} = \frac{१}{अ^२-२अ}$$

$$\left(\pm \sqrt{४(अ^२-१)^२ + २अ^२(१+अ^२)}\right)$$

$$(४७) अक्ष+१ = \frac{२अक्ष\sqrt{अ^२+क्ष}}{अ+\sqrt{अ^२+क्ष}} \dots \text{उ० क्ष} = \frac{१}{अ} + २\sqrt{अ}$$

$$(४८) (अ+क्ष)\sqrt{अ^२+क्ष^२} = ६(अ-क्ष)^३ \dots \text{उ० क्ष} = \frac{अ}{७}(१ \pm २\sqrt{७})$$

$$\text{अथवा } \frac{अ}{५}(४ \pm ३\sqrt{१-१})$$

$$(४९) अ(१-क्ष)+\sqrt{अ^२+१} = अ\sqrt{१+क्ष^२}$$

$$(५०) \frac{(क्ष-अ)^३}{\sqrt{क्ष}} + २(क्ष-अ) = \frac{अ^३}{\sqrt{क्ष}} + १$$



(६)

$$(५१) \frac{अ+क्ष}{\sqrt{अ+}\sqrt{अ+क्ष}} + \frac{अ-क्ष}{\sqrt{अ-}\sqrt{अ-क्ष}} = \sqrt{अ}$$

$$(५२) \sqrt{२क्ष-१} + \sqrt{१-अ} \cdot \sqrt{१-क्ष} = अक्ष$$

$$उ०क्ष = \frac{अ}{\sqrt{अ-१}} \left(\frac{\pm\sqrt{अ+१}}{२} - १ \right)^२$$

$$(५३) (१+क्ष)\sqrt{१+अ} + (१-क्ष)\sqrt{१-अ} = २\sqrt{१+क्ष} \dots उ०क्ष = \frac{१-\sqrt{१-अ}}{अ}$$

$$(५४) २क्ष^२ + (क्ष+१)^२ = क्ष^२ - १ \dots उ०क्ष = \pm \sqrt{\frac{१}{३}(१ \pm \sqrt{४७})}$$

अथवा $\pm \sqrt{\frac{१}{३}(१ \pm \sqrt{१०})}$

$$(५५) अ+क्ष\sqrt{१+अ} = अ\sqrt{१-क्ष^२} + क्ष\sqrt{१-अ} \dots$$

$$उ०क्ष = \frac{-४अ}{२\sqrt{१+अ^२} - \sqrt{१-अ^२}}$$

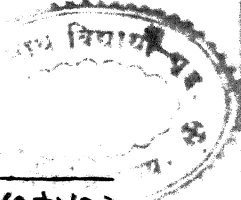
$$(५६) (क्ष - \frac{१}{३})^२ - \frac{२५}{९} = \frac{२क्ष + \frac{४}{९}}{२(क्ष - \frac{१}{३}) + \sqrt{क्ष^२ - \frac{८क्ष}{३}}}$$

उ०क्ष = ३ अथवा $-\frac{१}{३}$ अथवा $\frac{३}{२}(२ \pm \sqrt{१३})$

$$(५७) \sqrt{\frac{३अ}{४} - क्ष} + \sqrt{३अक्ष - क्ष} = \frac{३अ}{२} \sqrt{१-४क्ष} \dots$$

$$उ०क्ष = \frac{३}{४} \text{ अथवा } \frac{३अ-१}{१२(अ+१)}$$

$$(५८) (क्ष+३)^२ - २(क्ष+३) = २क्ष(क्ष+१) \dots उ०क्ष = ३ अथवा १ अथवा $\frac{१}{३}$$$



(७)

$$(५९) \sqrt{x^2-9} + x \sqrt{x^2-9} = x^2 \dots \dots \dots \text{उ० क्ष} = \pm \sqrt{\frac{2}{3}(9 \pm \sqrt{2})}$$

$$(६०) १६(x^2+2)^2 + \frac{3}{\sqrt{x^2+2}} = ३२x^2+४८ \dots \dots \dots \text{उ० क्ष} = \frac{3}{2}\sqrt{4}$$

$$(६१) x^2(x^2+a) + b(x^2+1) = x^2(ax+1) + (2bx-1) \quad \text{उ क्ष} = १$$

$$(६१) x-2\sqrt{x+2} = १ + \sqrt{x^2-3x+2} \dots \dots \dots$$

$$\text{उ० क्ष} = ९ \pm ४\sqrt{७} \text{ अथवा } \frac{9}{2}(3 \pm \sqrt{13})$$

$$(६२) \frac{(a^2-9)a + a^2x - x\sqrt{2a^2-9}}{(a^2-9)a + a^2x + x\sqrt{2a^2-9}} = (9-a^2)(9+ax^2) - 2ax^2$$

$$\text{उ० क्ष} = \frac{a(9-a^2)}{a^2-\sqrt{2a^2-9}} \text{ अथवा } \frac{\sqrt{9-a^2}(a\sqrt{9-a^2}+1)}{a^2+\sqrt{2a^2-9}}$$

$$(६३) \sqrt{9-a} \cdot \sqrt{\frac{9+x}{9-x}} + \sqrt{9+a} \sqrt{\frac{9-x}{9+x}} = 2\sqrt{9-a^2} \dots \dots \dots \text{क्ष} = \frac{2a}{a^2+1}$$

$$(६४) \frac{\sqrt{9+x}-1}{\sqrt{9-x}+1} + \frac{\sqrt{9-x}+1}{\sqrt{9+x}-1} = a \dots \dots \dots \text{उ० क्ष} = \frac{2\sqrt{a^2-9}}{a^2}$$

$$(६५) \frac{9-ax + \sqrt{9+a}-a\sqrt{9+x}}{9-ax + \sqrt{9+a^2}-x\sqrt{9+a}} = a$$

$$(66) (9-x)\sqrt{x^2+x^2} - (9+x)\sqrt{x^2-x^2} = \frac{\sqrt{2+2\sqrt{1-x^2}}}{x} \dots\dots$$

$$उ०क्ष = \pm \sqrt{1-\frac{9}{x}} (\pm \sqrt{1-\frac{x}{9}} + 1)^2$$

$$(67) (9-x)(9(1+\frac{9}{x})-2)^2 = \sqrt{x+9} + \sqrt{3x+9} \dots\dots$$

$$उ०क्ष = \pm \frac{\sqrt{x+9}-9}{\sqrt{x-9+9}}$$

$$(68) \frac{9+x-\sqrt{2x+x^2}}{9+x+\sqrt{2x+x^2}} = \sqrt{x} \cdot \frac{\sqrt{2+x}+\sqrt{x}}{\sqrt{2+x}-\sqrt{x}} \dots उ०क्ष = \frac{(1-\sqrt{x})^2}{2\sqrt{x}}$$

$$(69) \frac{9+x}{9+x+\sqrt{1+x^2}} + \frac{9-x}{9-x+\sqrt{1+x^2}} = x \dots उ०क्ष = \pm \sqrt{(2-x)^2-9}$$

$$(70) \frac{n-9}{n+9} \left(\frac{a^2+a^2x^2+x^2}{a^2-a^2x^2+x^2} \right) = (2-\frac{9}{n}) \left(\frac{ax}{a^2x^2} \right)^2$$

$$(71) \frac{x-\sqrt{x^2-a^2}}{\sqrt{x+\sqrt{x^2-a^2}}} = \sqrt{x^2-a^2} \left\{ \sqrt{x+ax} - \sqrt{x-ax} \right\} \dots\dots$$

$$उ०क्ष = \frac{2ax}{\sqrt{4-(\sqrt{2+ax}-a)^2}}$$

$$(72) \frac{9}{a} \sqrt{a+x} + \frac{9}{x} \sqrt{a+x} = \frac{9}{x} \sqrt{x} \dots उ०क्ष = \frac{अवने}{अ^2-बने}$$

प्रागैदित्तलीं

एकअक्षरीसमीकरणे

एथेसोडविलींआहेत

१९०६

$$(१) \sqrt{क्ष+अ} + \sqrt{क्ष-अ} = व$$

वर्गकरून $क्ष+अ+२\sqrt{क्ष-अ}+क्ष-अ=व^२$

$२क्ष+२\sqrt{क्ष-अ}=व^२ \therefore २\sqrt{क्ष-अ}=व^२-२क्ष$

वर्गकरून $४क्ष-४अ=व^२-४वक्ष+४क्ष^२$

$४वक्ष=व^२+४अ \therefore क्ष=\frac{व^२+४अ}{४व}$ हे उतर.

$$(२) \sqrt{१-क्ष^२} = अ(१+क्ष) = अ(२-१+क्ष)$$

$$= अ(२-(१-क्ष^२)) = २अ-अ(१-क्ष^२)$$

\therefore स्थलांतराने $अ(१-क्ष^२) + \sqrt{१-क्ष^२} = २अ$

४ अने गुणून $४अ(१-क्ष^२) + ४अ\sqrt{१-क्ष^२} = ८अ^२$

१ मिळवून $४अ(१-क्ष^२) + ४अ\sqrt{१-क्ष^२} + १ = ८अ^२ + १$

वर्गमूळ काढून $२अ\sqrt{१-क्ष^२} + १ = \pm\sqrt{८अ^२+१}$

स्थलांतराने $२अ\sqrt{१-क्ष^२} = \pm\sqrt{८अ^२+१}-१$

२ अने भागून $\sqrt{१-क्ष^२} = \frac{\pm\sqrt{८अ^२+१}-१}{२अ}$

वर्गकरून $१-क्ष^२ = \left(\frac{\pm\sqrt{८अ^२+१}-१}{२अ}\right)^२$

$$\therefore क्ष^२ = १ - \left(\frac{\pm\sqrt{८अ^२+१}-१}{२अ}\right)^२ \therefore क्ष = \sqrt{१ - \left(\frac{\pm\sqrt{८अ^२+१}-१}{२अ}\right)^२}$$

$$(३) \sqrt{अ+क्ष} + \sqrt{अ-क्ष} = २ब$$

स्थलांतराने $अ+क्ष = ४ब-४$ व $\sqrt{अ-क्ष} + अक्ष$

स्थलांतराने $४ब \sqrt{अ-क्ष} = ४ब-२क्ष$

वर्ग करून $१६अब-१६बेक्ष = १६ब-१६बेक्ष + ४क्ष$

स्थलांतराने $४क्ष = १६अब-१६ब = १६ब (अ-ब)$

वर्गमूल काढून $२क्ष = \pm ४ब \sqrt{अ-ब} \therefore क्ष = \pm २ब \sqrt{अ-ब}$

वर्गमूल काढून $क्ष = \pm \sqrt{\pm २ब \sqrt{अ-ब}}$

$$(४) \sqrt{१+क्ष+क्ष} = अ - \sqrt{१-क्ष+क्ष}$$

वर्ग करून $१+क्ष+क्ष = अ-२अ \sqrt{१-क्ष+क्ष} + १-क्ष+क्ष$

स्थलांतराने $२अ \sqrt{१-क्ष+क्ष} = अ-२क्ष$

वर्ग करून $४अ-४अक्ष + ४अक्ष = अ-४अक्ष + ४क्ष$

स्थलांतराने $४अक्ष-४क्ष = अ-४अ$

क्ष गुणांक काढून $क्ष (४अ-४) = अ-४अ$

$$\therefore क्ष = \frac{अ-४अ}{४अ-४} \therefore क्ष = \frac{१}{२} \sqrt{\frac{अ-४}{अ-१}}$$

(3)

$$(५) \frac{अक्ष-१}{\sqrt{अक्ष+१}} = ४ + \frac{\sqrt{अक्ष-१}}{२}$$

$$\frac{(\sqrt{अक्ष-१})(\sqrt{अक्ष+१})}{\sqrt{अक्ष+१}} = ४ + \frac{\sqrt{अक्ष-१}}{२}$$

$$\sqrt{अक्ष+१} \text{ याचा संक्षेपदेऊन } \sqrt{अक्ष-१} = ४ + \frac{\sqrt{अक्ष-१}}{२} \quad 6$$

$$\text{स्थळांतराने } \sqrt{अक्ष-१} - \frac{\sqrt{अक्ष-१}}{२} = ४$$

$$\frac{\sqrt{अक्ष-१}}{२} = ४ \therefore \sqrt{अक्ष} = ९ \therefore अक्ष = \frac{८१}{अ}$$

$$(६) \frac{अ-क्ष + \sqrt{२अक्ष-क्ष^२}}{अ-क्ष} = ब$$

$$\frac{अ-क्ष}{अ-क्ष} + \frac{\sqrt{२अक्ष-क्ष^२}}{अ-क्ष} = ब$$

$$\text{स्थळांतराने } \frac{\sqrt{२अक्ष-क्ष^२}}{अ-क्ष} = ब-१, \text{ कारण } \frac{अ-क्ष}{अ-क्ष} = १$$

$$\text{वर्गकृत } \frac{२अक्ष-क्ष^२}{अ^२-२अक्ष+क्ष^२} = (ब-१)^२ = \frac{(ब-१)^२}{१}$$

$$\frac{अ^२-२अक्ष+क्ष^२}{(अ^२-२अक्ष+क्ष^२) + (२अक्ष-क्ष^२)} = \frac{१}{१+(ब-१)^२}$$

$$\frac{अ^२-२अक्ष+क्ष^२}{अ} = \frac{१}{१+(ब-१)^२}$$

(४)

$$\text{वर्गमूलकादन } \frac{अ-क्ष}{अ} = \frac{१}{\sqrt{१+(ब-१)^2}}$$

$$अ-क्ष = \frac{अ}{\sqrt{१+(ब-१)^2}} \therefore क्ष = अ + \frac{अ}{\sqrt{१+(ब-१)^2}}$$

$$(७) \frac{अ+क्ष + \sqrt{२अक्ष+अ^2}}{अ+क्ष - \sqrt{२अक्ष+अ^2}} = ब$$

$$\frac{२(अ+क्ष)}{२\sqrt{२अक्ष+अ^2}} = \frac{ब+१}{ब-१} \therefore \frac{अ+क्ष}{\sqrt{क्ष^2+२अक्ष}} = \frac{ब+१}{ब-१}$$

$$\text{वर्गकरून } \frac{अ^2+२अक्ष+क्ष^2}{क्ष^2+२अक्ष} = \frac{(ब+१)^2}{(ब-१)^2}$$

$$\frac{अ^2+२अक्ष+क्ष^2}{अ^2+२अक्ष+क्ष^2 - (क्ष^2+२अक्ष)} = \frac{(ब+१)^2}{(ब+१)^2 - (ब-१)^2} = \frac{(ब+१)^2}{४ब}$$

$$\frac{अ^2+२अक्ष+क्ष^2}{अ^2} = \frac{(ब+१)^2}{४ब} \therefore \frac{अ+क्ष}{अ} = \frac{ब+१}{२\sqrt{ब}}$$

$$अ+क्ष = अ \frac{ब+१}{२\sqrt{ब}} \therefore क्ष = अ \frac{ब+१}{२\sqrt{ब}} - अ = अ \left(\frac{ब+१}{२\sqrt{ब}} - १ \right)$$

$$\therefore क्ष = अ \left(\frac{ब+१-२\sqrt{ब}}{२\sqrt{ब}} \right) = \frac{अ}{२\sqrt{ब}} (ब-१)^2$$

$$(८) \frac{अ+क्ष + \sqrt{अ+क्ष^2}}{अ+क्ष - \sqrt{अ+क्ष^2}} = ब$$

$$\frac{२(अ+क्ष)}{२\sqrt{अ+क्ष^2}} = \frac{ब+१}{ब-१} \therefore \frac{अ+क्ष}{\sqrt{अ+क्ष^2}} = \frac{ब+१}{ब-१}$$

(५)

$$\text{वर्गीकरण } \frac{अ^2 + 2अक्ष + क्ष^2}{अ^2 + क्ष^2} = \frac{(ब+१)^2}{(ब-१)^2}$$

$$\frac{अ^2 + 2अक्ष + क्ष^2}{2(अ^2 + क्ष^2) - (अ^2 + 2अक्ष + क्ष^2)} = \frac{(ब+१)^2}{2(ब-१)^2 - (ब+१)^2}$$

$$\frac{अ^2 + 2अक्ष + क्ष^2}{अ^2 + 2अक्ष + क्ष^2} = \frac{(ब+१)^2}{ब - २ब + १} \quad (ब+१)^2 = ब$$

$$\frac{अ + क्ष}{अ - क्ष} = \frac{ब+१}{\sqrt{(ब+१)^2 = ब}} = \frac{१}{\sqrt{१ - \frac{ब}{ब+१}}}$$

$$\frac{२क्ष}{अ} = \frac{१ - \sqrt{१ - \frac{ब}{ब+१}}}{१ + \sqrt{१ - \frac{ब}{ब+१}}} \quad \therefore क्ष = अ \cdot \frac{१ - \sqrt{१ - \frac{ब}{ब+१}}}{१ + \sqrt{१ - \frac{ब}{ब+१}}}$$

$$(९) \quad क्ष = \frac{२}{\sqrt{क्ष}} = २ \quad \therefore क्ष = 2 + \frac{२}{\sqrt{क्ष}} \quad \therefore क्ष - १ = 2 + \frac{२}{\sqrt{क्ष}}$$

$$(\sqrt{क्ष} - १)(\sqrt{क्ष} + १) = \frac{२}{\sqrt{क्ष}} (\sqrt{क्ष} + १)$$

$$\sqrt{क्ष} + १ \text{ वा-बास क्षेप देऊन } \sqrt{क्ष} - १ = \frac{२}{\sqrt{क्ष}}$$

$$२ \text{ मिळऊन } \sqrt{क्ष} + १ = २ + \frac{२}{\sqrt{क्ष}} = \frac{२}{\sqrt{क्ष}} (\sqrt{क्ष} + १)$$

$$\therefore १ = \frac{२}{\sqrt{क्ष}} \quad \therefore \sqrt{क्ष} = २ \quad \therefore क्ष = ४$$



$$(१०) \sqrt{\frac{a+x}{a-x}} - \frac{a}{x} = \frac{a}{x} \sqrt{\frac{a+x}{a-x}} - \frac{a}{x} = \frac{a}{x} \left(\sqrt{\frac{a+x}{a-x}} - 1 \right)$$

$$\text{समन्तराने } \sqrt{\frac{a+x}{a-x}} - 1 = \frac{a}{x} \left(\sqrt{\frac{a+x}{a-x}} - 1 \right)$$

$$\text{वर्गकरते } \frac{a+x}{a-x} - 2\frac{a}{x} \sqrt{\frac{a+x}{a-x}} + \frac{a^2}{x^2} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\text{समन्तराने } \frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\text{वर्गकरते } \frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\text{समन्तराने } \frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\text{सोनेभायत } \frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\text{सो पुणककादून } \frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$\frac{a+x}{a-x} - 2\frac{a}{x} = \frac{a^2}{x^2} \left(\frac{a+x}{a-x} - 2\sqrt{\frac{a+x}{a-x}} + 1 \right)$$

$$(११) \frac{a}{x} + 1 = 0$$

$$\text{सो यानेभायत } \frac{a}{x} + 1 = 0$$

$$\pm 2\text{मिळउन } \frac{a}{x} \pm 2 + \frac{1}{x} = \pm 2$$

$$\text{वर्गकरते } \frac{a}{x} \pm 2 + \frac{1}{x} = \pm 2$$

$$\text{म्हणते } \frac{a}{x} + \frac{1}{x} = \pm 2$$



$$\frac{1}{x} = \pm \sqrt{-2}$$

$$\therefore \text{वेरिजेने २क्ष} = \pm \sqrt{2} \pm \sqrt{-2} \therefore \text{क्ष} = \frac{1}{2} (\pm \sqrt{2} \pm \sqrt{-2})$$

$$(12) \quad \frac{4x+10}{x+8} + \frac{3x-13}{x-5} = \frac{10x+80}{2x+7} + \frac{10x+9}{5x+8}$$

$$\frac{4x+16+1}{x+8} + \frac{3x-15+2}{x-5} = \frac{10x+20+60}{2x+7} + \frac{10x+9}{5x+8}$$

$$\frac{4x+16}{x+8} + \frac{1}{x+8} + \frac{3x-15}{x-5} = \frac{10x+80}{2x+7} + \frac{10x+9}{5x+8}$$

$$+ \frac{1}{5x+8}$$

$$\frac{4x+16}{x+8} + \frac{1}{x+8} + \frac{3x-15}{x-5} = \frac{10x+80}{2x+7} + \frac{10x+9}{5x+8}$$

$$\frac{4x+16}{x+8} + \frac{1}{x+8} = \frac{10x+80}{2x+7} + \frac{10x+9}{5x+8}$$

$$\frac{4x+16+1}{(x+8)(x-5)} = \frac{20x+80+20x+9}{(2x+7)(5x+8)}$$

$$\frac{4x+17}{x^2-3x-40} = \frac{40x+89}{10x^2+43x+56}$$

$$\therefore \frac{10x^2+43x+56}{x^2-3x-40} = \frac{40x+89}{10x^2+43x+56} = 1$$

$$\therefore 10x^2+43x+56 = 10x^2-30x-400$$

$$x^2 + 4x = -20 \therefore x = \pm \sqrt{16 - 20}$$

$$(13) \quad x + 4 + \sqrt{\frac{x+4}{x-4}} = \frac{12}{x-4}$$

$$x-4 \text{ पाने भागते } \frac{x+4}{x-4} + \frac{1}{x-4} \sqrt{\frac{x+4}{x-4}} = \frac{12}{(x-4)^2}$$

$$\text{वर्ग पूर्ण करूत } \frac{x+4}{x-4} + \frac{1}{x-4} \sqrt{\frac{x+4}{x-4}} + \frac{1}{4(x-4)^2} = \frac{12}{4(x-4)^2}$$

$$\text{वर्ग मूळ काढू } \sqrt{\frac{x+4}{x-4}} + \frac{1}{2(x-4)} = \frac{3}{2(x-4)}$$

$$\text{अज्ञात राने } \sqrt{\frac{x+4}{x-4}} = \frac{1}{2(x-4)} = \frac{1}{x-4}$$

$$\text{वर्ग करूत } \frac{x+4}{x-4} = \frac{1}{(x-4)^2}$$

$$x-4 \text{ चा संक्षेप देऊन } x+4 = \frac{1}{x-4}$$

$$\therefore x^2 - 9 = 1 \therefore x^2 = 10 \therefore x = \pm \sqrt{10}$$

$$(14) \quad \frac{a^2 + b^2}{(a+b)^2} = \frac{1}{2} \therefore \frac{(a+b)^2}{a^2 + b^2} = \frac{2}{1}$$

$$\frac{a^2 + b^2 + 2ab + a^2 + b^2}{a^2 + b^2} = \frac{2}{1}$$

(9)

$$\frac{\frac{a^2}{a^2} + 8ab \left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + \frac{b^2}{a^2}}{\frac{a^2}{a^2} + \frac{b^2}{a^2}} = \frac{9}{b}$$

$$\frac{a^2}{a^2} + \frac{b^2}{a^2}$$

$$\frac{\frac{a^2}{a^2} + \frac{b^2}{a^2} + 8 \left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + 6}{\frac{a^2}{a^2} + \frac{b^2}{a^2}} = \frac{9}{b}$$

$$\frac{a^2}{a^2} + \frac{b^2}{a^2}$$

$$\frac{\frac{a^2}{a^2} + \frac{b^2}{a^2} + 8 \left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + 6}{\frac{a^2}{a^2} + \frac{b^2}{a^2}} = \frac{9}{b}$$

$$\frac{a^2}{a^2} + \frac{b^2}{a^2}$$

$$\frac{\left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + 8 \left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + 6}{\frac{a^2}{a^2} + \frac{b^2}{a^2}} = \frac{9}{b}$$

$$\frac{a^2}{a^2} + \frac{b^2}{a^2}$$

$$\frac{\frac{a^2}{a^2} + \frac{b^2}{a^2} + 8 \left(\frac{a^2}{a^2} + \frac{b^2}{a^2} \right) + 6}{\frac{a^2}{a^2} + \frac{b^2}{a^2}} = \frac{9}{b}$$

$$\frac{a^2}{a^2} + \frac{b^2}{a^2} + 2 - 2$$

(90)

$$\frac{\left(\frac{a}{x} + \frac{x}{a}\right)^2 + 8 \left(\frac{a}{x} + \frac{x}{a}\right) + 8}{\left(\frac{a}{x} + \frac{x}{a}\right)^2 - 2} = \frac{9}{b}$$

$$\frac{9}{b} \left(\frac{a}{x} + \frac{x}{a}\right)^2 - \frac{2}{b} = \left(\frac{a}{x} + \frac{x}{a}\right)^2 + 8 \left(\frac{a}{x} + \frac{x}{a}\right) + 8$$

$$\text{स्थानान्तराने } \left(\frac{a}{x} + \frac{x}{a}\right)^2 \left(\frac{1}{b} - 1\right) - 8 \left(\frac{a}{x} + \frac{x}{a}\right) = 8 + \frac{2}{b}$$

$$\left(\frac{a}{x} + \frac{x}{a}\right)^2 - \frac{8}{b-1} \left(\frac{a}{x} + \frac{x}{a}\right) = \frac{8 + \frac{2}{b}}{b-1}$$

$$\therefore \frac{a}{x} + \frac{x}{a} = \frac{1}{b-1} \left(2b + \sqrt{2(9+b)}\right) = m$$

$$\frac{a}{x} + \frac{x}{a} = m \therefore a + \frac{x^2}{a} = amx$$

$$x^2 - amx = -a \therefore x = \frac{am}{2} \left(m + \sqrt{m^2 - 4}\right)$$

$$(91) \sqrt{(a+x)^2 - 2} \sqrt{(a+x)^2} = \sqrt{a^2 - x^2}$$

$$(a+x)^2 \sqrt{(a+x)^2 - 2} = (a-x)^2 \sqrt{a^2 - x^2} = (a+x)^2 (a-x)^2$$

$$\frac{(a+x)^2 \sqrt{(a+x)^2 - 2}}{(a-x)^2 \sqrt{a^2 - x^2}} = \frac{(a+x)^2 (a-x)^2 \sqrt{(a+x)^2 - 2}}{(a-x)^2 (a-x)^2 \sqrt{a^2 - x^2}} = \frac{(a+x)^2 \sqrt{(a+x)^2 - 2}}{(a-x)^2 \sqrt{a^2 - x^2}}$$

(99)

$$\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} - 2 = \frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} \therefore \text{स्थ.} \frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} - \frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}}$$

वर्गपूर्णकरून $\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} - \frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} + \frac{1}{4} = 2 + \frac{1}{4} = \frac{9}{4}$

वर्गमूळकाढून $\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} - \frac{1}{2} = + \frac{3}{2}$

स्थळान्तरानें $\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} = + \frac{3}{2} + \frac{1}{2} = 2$ अथवा -1

जर $\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} = 2$ तर $\frac{अ+क्ष}{अ-क्ष} = 2 \therefore क्ष = \frac{3अ}{अ}$

आणि जर $\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} = -1$ तर $\frac{अ+क्ष}{अ-क्ष} = -1$ इत्यादि

(98) $(अ+क्ष)^{\frac{3}{2}} + 8(अ-क्ष)^{\frac{3}{2}} = 9(अ-क्ष)^{\frac{3}{2}}$

$$\frac{(अ+क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} + 8 \frac{(अ-क्ष)^{\frac{3}{2}}}{(अ-क्ष)^{\frac{3}{2}}} = 9$$

$$(92) \quad \frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} + 8 \frac{(a-x)^{\frac{2}{3}}}{(a+x)^{\frac{2}{3}}} = 9$$

$$\frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} + 8 \frac{(a-x)^{\frac{2}{3}}}{(a+x)^{\frac{2}{3}}} + 8 = 9 \quad \text{चारमिळऊन}$$

$$\frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} + 8 \frac{(a-x)^{\frac{2}{3}}}{(a+x)^{\frac{2}{3}}} - 8 = 1 \quad \text{चारवजाकरून}$$

$$\text{वर्गमूळकाढून} \quad \frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} + 2 \frac{(a-x)^{\frac{2}{3}}}{(a+x)^{\frac{2}{3}}} = 3$$

$$\frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} - 2 \frac{(a-x)^{\frac{2}{3}}}{(a+x)^{\frac{2}{3}}} = 1$$

$$\text{वेरिज घेऊन} \quad \frac{2(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} = 8 \therefore \frac{(a+x)^{\frac{2}{3}}}{(a-x)^{\frac{2}{3}}} = 4 \therefore \frac{a+x}{a-x} = \frac{16}{8} = 2$$

$$(99) \sqrt{1+x} + \sqrt{1-x} = \sqrt{2}$$

$$\text{घनकरून} \quad 1+x + \sqrt{1+x}\sqrt{1-x} + 1-x = 2 \quad \sqrt{1+x}\sqrt{1-x} = 0$$

$$\text{स्थलांतराने} \quad \sqrt{1+x}\sqrt{1-x} = 0 \quad \sqrt{1+x} + \sqrt{1-x} = 2 \quad 1+1 = 2 \quad 0 = 0$$

(93)

$$\therefore 3\sqrt{9+k}\sqrt{9-k} = \frac{0}{\sqrt{2}} = 0 \text{ कारण } \sqrt{9+k} + \sqrt{9-k} = \sqrt{2}$$

$$\therefore \sqrt{9+k}\sqrt{9-k} = \frac{0}{3} = 0 \therefore \sqrt{9+k} = 0 \text{ अथवा } \sqrt{9-k} = 0$$

$$\therefore k = -9 \text{ अथवा } k = 9$$

$$(90) \sqrt{9-k+k^2} = \sqrt{k} + \sqrt{9+k+k^2}$$

$$\text{सब्यंतराने } \sqrt{9-k+k^2} - \sqrt{9+k+k^2} = \sqrt{k}$$

$$(9-k+k^2) - 3\sqrt{9-k+k^2}\sqrt{9+k+k^2} + (9+k+k^2) = k$$

$$-3\sqrt{(9+k^2)-k^2} \times \sqrt{k} = k + (9+k+k^2) - 9 - k - k^2$$

$$-3\sqrt{9+k^2+k^2} \times \sqrt{k} = 3k \therefore \sqrt{k} = 0 \therefore k = 0$$

$$\sqrt{9+k^2+k^2} = \frac{3k}{-3\sqrt{k}} = -\sqrt{k}$$

$$\text{पुनकरून } 9+k^2+k^2 = -k^2 \therefore 9+2k^2+k^2 = 0 \therefore 9+k^2 = 0$$

$$\therefore k^2 = -9 \therefore k = \pm\sqrt{-9}$$

$$(91) k^2 - \frac{2}{3}k = 9 \frac{4}{9} \therefore k^2 - \frac{2}{3}k = 9 + \frac{4}{9}$$

$$\left(k + \frac{2}{3}\right) \left(k - \frac{2}{3}\right) = 9 \left(k + \frac{2}{3}\right) \therefore k + \frac{2}{3} = 0 \therefore k = -\frac{2}{3}$$

(१४)

$$\text{अथवा } x - \frac{2}{x} = \frac{1}{x} \quad \therefore x^2 - \frac{2x}{x} = 1 \quad \therefore x^2 = \frac{1}{x} (1 \pm \sqrt{10})$$

$$(20) x^3 + \frac{1}{x} = 24 \frac{x}{x^2} - \frac{1}{x^2} - \frac{1}{x^2}$$

$$\text{संबंधानराने } x^3 + \frac{1}{x^2} + x + \frac{1}{x^2} = 24 \frac{x}{x^2} \quad \text{कारण } \frac{1}{x} = \frac{1}{x}$$

$$\text{संमिळऊन } x^3 + 2 + \frac{1}{x^2} + x + \frac{1}{x^2} = 24 \frac{x}{x^2}$$

$$(x + \frac{1}{x})^2 + (x + \frac{1}{x}) = 24 \frac{x}{x^2} \quad \text{यावर्गसमीकरणा}$$

$$\text{वरून } x + \frac{1}{x} = \frac{12}{x} \quad \therefore x^2 + 1 = \frac{12x}{x} \quad \therefore x^2 - \frac{12x}{x} = -1$$

$$\therefore x = \frac{1}{2} (12 \pm 3\sqrt{33})$$

$$(21) \frac{a+x-\sqrt{a^2-x^2}}{a+x+\sqrt{a^2-x^2}} = \frac{b}{x}$$

$$\frac{\sqrt{a+x} \cdot \sqrt{a+x} - \sqrt{a+x} \cdot \sqrt{a-x}}{\sqrt{a+x} \cdot \sqrt{a+x} + \sqrt{a+x} \cdot \sqrt{a-x}}$$

$$\therefore \frac{\sqrt{a+x} - \sqrt{a-x}}{\sqrt{a+x} + \sqrt{a-x}} = \frac{b}{x} \quad \sqrt{a+x} - \text{ना संक्षेप संकन}$$

$$\frac{\sqrt{a+b} - \sqrt{a-b}}{(\sqrt{a+b} + \sqrt{a-b})} = \frac{2b}{(\sqrt{a+b} + \sqrt{a-b})(\sqrt{a+b} - \sqrt{a-b})}$$

$$\sqrt{a+b} + \sqrt{a-b} \text{ वासंक्षेपदेऊन } \sqrt{a+b} - \sqrt{a-b} = \frac{2b}{\sqrt{a+b} - \sqrt{a-b}}$$

$$\sqrt{a+b} + \sqrt{a-b} - 2\sqrt{a-b} + \sqrt{a-b} = 2b$$

$$\text{स्थळान्तराने } \frac{2\sqrt{a-b}}{+} = \frac{2b}{+} - 2a \therefore \sqrt{a-b} = a-b$$

$$\text{वर्गकरणे } \frac{a-b}{*+} = \frac{a^2 - 2ab + b^2}{*+} \therefore a-b = 2ab - b^2$$

$$(32) \frac{a - \sqrt{2ax - x^2}}{a + \sqrt{2ax - x^2}} = \frac{x}{a-x}$$

$$\frac{a - \sqrt{2ax - x^2}}{a - \sqrt{2ax - x^2}} \times \frac{a - \sqrt{2ax - x^2}}{a - \sqrt{2ax - x^2}} = \frac{x}{a-x}$$

$$\frac{(a - \sqrt{2ax - x^2})^2}{a - (2ax - x^2)} = \frac{x}{a-x}$$

$$\frac{(a - \sqrt{2ax - x^2})^2}{a - 2ax + x^2} = \frac{x(a^2 - 2ax + x^2)}{a - 2ax + x^2} = \frac{x(a-x)}{a-x}$$

$$a - 2a\sqrt{2ax - x^2} + 2ax - x^2 = ax - x^2$$

स्थानंतराने $-2a\sqrt{2ax - x^2} = ax - 2ax - a^2 = -ax - a^2$

$-$ अने भागून $\sqrt{2ax - x^2} = x + a$

$$\therefore 4\sqrt{2ax - x^2} = 2x + 2a = (2a - x) + 3x$$

स्थानंतराने $(2a - x) - 4\sqrt{2ax - x^2} = -3x$

वर्गपूर्ण करून $(2a - x) - 4\sqrt{2ax - x^2} + 4x = x$

वर्गमूळ काढून $\sqrt{2ax - x^2} - 2\sqrt{x} = \sqrt{x} \therefore \sqrt{2ax - x^2} = 3\sqrt{x}$

$$\therefore 2a - x = 3\sqrt{x} \therefore 9x = 2a - x \therefore x = \frac{2a}{4}$$

जेव्हा $\sqrt{2ax - x^2} - 2\sqrt{x} = -\sqrt{x} \therefore \sqrt{2ax - x^2} = \sqrt{x} \therefore x = a$

(22) $\frac{a+x}{\sqrt{ax-x^2}} + \frac{a-x}{\sqrt{ax+x^2}} = 2\sqrt{a}$

दोन्ही बाजूंवरून $(a+x)^2 + (a-x)^2 = 2\sqrt{a}\sqrt{ax-x^2}$

वर्ग करून $(a+x)^2 + (a-x)^2 + 2(a-x)^2 = 4a(a-x)$

(१७)

$$\left\{ \begin{array}{l} \text{अ} + 3\text{अक्ष} + 3\text{अक्ष} + \text{क्ष} + \text{अ} - 2\text{अक्ष} + 2\text{अक्ष} - \text{क्ष} + 2 \\ (\text{अ} - \text{क्ष})^2 = 4\text{अ} - 4\text{अक्ष} \end{array} \right.$$

$$\text{स्थळांतराने } 2(\text{अ} - \text{क्ष})^2 = 4\text{अ} - 4\text{अक्ष} - 4\text{अक्ष} - 2\text{अ}$$

$$- \text{अ} - \text{क्ष} = 2\text{अ} - 10\text{अक्ष}$$

$$2\text{नीने भागून } (\text{अ} - \text{क्ष})^2 = \text{अ} - 5\text{अक्ष}$$

$$\text{वर्गकरून } (\text{अ} - \text{क्ष})^2 = \text{अ} - 10\text{अक्ष} + 25\text{अक्ष}^2$$

$$\text{अ} - 2\text{अक्ष} + 3\text{अक्ष} - \text{क्ष} = \text{अ} - 10\text{अक्ष} + 25\text{अक्ष}^2$$

$$\text{स्थळांतराने } -\text{क्ष} + 3\text{अक्ष} - 25\text{अक्ष}^2 = -10\text{अक्ष} + 3\text{अक्ष}$$

$$\text{क्ष ने भागून } -\text{क्ष} - 22\text{अक्ष} = -7\text{अक्ष}$$

$$\therefore \text{क्ष} + 22\text{अक्ष} = 7\text{अक्ष} \therefore \text{क्ष} = \text{अ} (\pm \sqrt{2-11})$$

$$\therefore \text{क्ष} = \pm \text{अ} \sqrt{\pm \sqrt{2-11}}$$

$$(28) \frac{243 + 324\sqrt{3}\text{क्ष}}{9\text{क्ष} - 2} = (4\sqrt{3}\text{क्ष} - \sqrt{3})^2$$

$$\frac{29\sqrt{3}(\sqrt{3} + 4\sqrt{3}\text{क्ष})}{(4\sqrt{3}\text{क्ष} - \sqrt{3})(4\sqrt{3}\text{क्ष} + \sqrt{3})} = (4\sqrt{3}\text{क्ष} - \sqrt{3})^2$$

(१८)

$$\therefore \frac{8\sqrt{3}}{8\sqrt{3}-\sqrt{3}} = (8\sqrt{3}-\sqrt{3})^2 \therefore 8\sqrt{3} = (8\sqrt{3}-\sqrt{3})^2$$

$$\text{घनमूलकातून } 8\sqrt{3} = 8\sqrt{3}-\sqrt{3} \therefore 8\sqrt{3} = 8\sqrt{3} \therefore 3 = 3$$

$$(2.4) \frac{(1+x^3)}{(1+x)^3} + \frac{(1-x^3)}{(1-x)^3} = \text{अ}$$

$$\frac{(1-x+x^3)(1+x)}{(1+x)^3(1+x)} + \frac{(1+x+x^3)(1-x)}{(1-x)^3(1-x)} = \text{अ}$$

$$\frac{1-x+x^3}{(1+x)^2} + \frac{1+x+x^3}{(1-x)^2} = \text{अ}$$

$$\frac{(1+x^3+2x)-3x}{(1+x)^2} + \frac{1+x^3+2x+3x}{(1-x)^2} = \text{अ}$$

$$\frac{1+x^3+2x}{(1+x)^2} - \frac{3x}{(1+x)^2} + \frac{1+x^3+2x}{(1-x)^2} + \frac{3x}{(1-x)^2} = \text{अ}$$

$$\text{स्थलांतरानें } \frac{-3x}{(1+x)^2} + \frac{3x}{(1-x)^2} = \text{अ} - \frac{1+x^3+2x}{(1+x)^2} - \frac{1+x^3+2x}{(1-x)^2}$$
$$= \text{अ} - 1 - 1 = \text{अ} - 2$$

$$-3x(1-x)^2 + 3x(1+x)^2 = (\text{अ}-2)(1-x)^2$$

(१९)

$$-3\sqrt{x} + 6\sqrt{x} - 3\sqrt{x} + 3\sqrt{x} + 6\sqrt{x} + 3\sqrt{x} = (a-2)(9-x)^2$$

$$9\sqrt{x} = (a-2)(9-x)^2 \therefore$$

$$\text{वर्गमूलकाढून } 2\sqrt{x} \sqrt{3} = \sqrt{a-2}(9-x) = \sqrt{a-2-x}\sqrt{a-2}$$

$$\therefore \sqrt{x}\sqrt{a-2} + 2\sqrt{x}\sqrt{3} = \sqrt{a-2} \therefore \sqrt{x} + \frac{2\sqrt{3}}{\sqrt{a-2}} \cdot \sqrt{x} = 1$$

$$\therefore \sqrt{x} = \frac{+\sqrt{a+9}-\sqrt{3}}{\sqrt{a-2}}$$

$$(26) \frac{(1+\sqrt{x})^2}{(1+\sqrt{x})^3} + \frac{(1-\sqrt{x})^2}{(1-\sqrt{x})^3} = b$$

$$\frac{1}{1+\sqrt{x}} + \frac{1}{1-\sqrt{x}} = b \therefore \frac{1-\sqrt{x}+1+\sqrt{x}}{1-x^2} = b$$

$$\frac{2}{1-x^2} = b \therefore 1-x^2 = \frac{2}{b} \therefore x^2 = 1 - \frac{2}{b} \therefore \sqrt{x} = \pm \frac{\sqrt{b-2}}{b}$$

$$(27) \frac{2a\sqrt{1+\sqrt{x}}}{1-\sqrt{x}+\sqrt{1+\sqrt{x}}} = a+b$$

$$\therefore 2a - \frac{2a\sqrt{1+\sqrt{x}}}{1-\sqrt{x}+\sqrt{1+\sqrt{x}}} = 2a - (a+b)$$

१ (२०)

$$\frac{2a(1-k) + 2a\sqrt{1+k^2} - 2a\sqrt{1+k^2}}{1-k + \sqrt{1+k^2}} = a-b$$

$$\frac{2a(1-k)}{1-k + \sqrt{1+k^2}} = a-b \therefore \frac{2a}{a-b} = \frac{1-k + \sqrt{1+k^2}}{1-k}$$

$$\frac{2a}{a-b} = \frac{1-k}{1-k} + \frac{\sqrt{1+k^2}}{1-k} = 1 + \frac{\sqrt{1+k^2} - 2k + 2k}{1-k}$$

$$\text{स्थळांतरानें } \sqrt{\frac{(1-2k+k^2)}{(1-k)^2}} + \frac{2k}{(1-k)^2} = \frac{2a}{a-b} - 1 = \frac{a+b}{a-b}$$

$$\text{वर्ग करून } \frac{1-2k+k^2}{(1-k)^2} + \frac{2k}{(1-k)^2} = \frac{(a+b)^2}{(a-b)^2}$$

$$\text{स्थळांतरानें } \frac{2k}{(1-k)^2} = \frac{(a+b)^2}{(a-b)^2} - 1 = \frac{(a+b)^2 - (a-b)^2}{(a-b)^2} = \frac{4ab}{(a-b)^2}$$

$$\therefore \frac{4k}{(1-k)^2} = \frac{4ab}{(a-b)^2} \therefore \frac{4k + (1-k)^2}{(1-k)^2} = \frac{4ab + (a-b)^2}{(a-b)^2}$$

$$\therefore \frac{(1+k)^2}{(1-k)^2} = \frac{(a+b)^2 + 4ab}{(a-b)^2} \therefore 1+k = \frac{\sqrt{(a+b)^2 + 4ab}}{a-b}$$

$$\frac{2k}{2} = \frac{\sqrt{(a+b)^2 + 4ab} - (a-b)}{\sqrt{(a+b)^2 + 4ab} + (a-b)}$$

(२१)

$$(20) \text{क्ष}^2 (\text{अ} + \text{क्ष}) + \text{बक्ष} (\text{अ} + \text{क्ष}) = \text{ब} - (\text{क्ष} + 2\text{ब})$$

$$\text{क्ष} (\text{अ} + \text{क्ष}) (\text{क्ष} + \text{ब}) = \text{ब} - \text{क्ष} - 2\text{ब} = -\text{क्ष} - \text{ब}$$

$$\text{स्थलांतराने} \text{क्ष} (\text{अ} + \text{क्ष}) (\text{क्ष} + \text{ब}) + \text{क्ष} + \text{ब} = 0$$

$$(\text{क्ष} + \text{ब}) (\text{क्ष} (\text{अ} + \text{क्ष}) + 1) = 0 \therefore \text{क्ष} + \text{ब} = \frac{0}{\text{क्ष} (\text{अ} + \text{क्ष}) + 1}$$

$$\therefore \text{क्ष} + \text{ब} = 0 \text{ अथवा } \text{क्ष} (\text{अ} + \text{क्ष}) + 1 = 0$$

$$\text{जर } \text{क्ष} + \text{ब} = 0 \text{ तर } \text{क्ष} = -\text{ब} \text{ आणि जर } \text{क्ष} (\text{अ} + \text{क्ष}) + 1 = 0$$

$$\text{तर } \text{क्ष}^2 + \text{अक्ष} = -1 \therefore \text{क्ष} = \frac{1}{2} \left(\pm \sqrt{\text{अ}^2 - 4} \right)$$

$$(29) \frac{1 + \text{क्ष}^3}{1 + \text{क्ष}} + \frac{1 - \text{क्ष}^3}{1 - \text{क्ष}} = \text{अ}$$

$$\frac{1 - \text{क्ष} + \text{क्ष}^3}{1 + \text{क्ष}} + \frac{1 + \text{क्ष} + \text{क्ष}^3}{1 - \text{क्ष}} = \text{अ}$$

$$\frac{(1 - \text{क्ष})^2 + \text{क्ष}^3 (1 - \text{क्ष}) + (1 + \text{क्ष})^2 + \text{क्ष}^3 (1 + \text{क्ष})}{(1 + \text{क्ष}) (1 - \text{क्ष})} = \text{अ}$$

$$\frac{1 - 2\text{क्ष} + \text{क्ष}^3 + \text{क्ष}^3 - \text{क्ष}^4 + 1 + 2\text{क्ष} + \text{क्ष}^3 + \text{क्ष}^4}{1 - \text{क्ष}^2} = \text{अ}$$

(२२)

$$\frac{2+8x^3}{1-x^3} = a \therefore 2+8x^3 = a - ax^3 \therefore x^3(a+8) = a-2$$

$$(20) \sqrt{1+x^3} - ax + \sqrt{(1-x^3)+ax} = x$$

$$\text{स्थलांतराने } \sqrt{(1+x^3)} - ax = x - \sqrt{(1-x^3)+ax}$$

$$\text{वर्गकरून } (1+x^3) - ax = x^2 - 2x\sqrt{(1-x^3)+ax} + (1-x^3) + ax$$

$$\text{स्थलांतराने } 2x\sqrt{(1-x^3)+ax} = x^2 + (1-x^3) - (1+x^3) + 2ax$$

$$\therefore 2x\sqrt{(1-x^3)+ax} = x^2 + 1 - 2x^3 + x^3 - 1 - 2x^3 - x^2 + 2ax$$

$$2x\sqrt{(1-x^3)+ax} = x^2 - 4x^3 + 2ax \therefore x = 0$$

$$2x\text{ने भागून } \sqrt{(1-x^3)+ax} = \frac{x}{2} - 2 + a$$

$$\text{वर्गकरून } (1-x^3) + ax = \frac{x^2}{4} - 2x + 4 + a^2 + ax - 4a$$

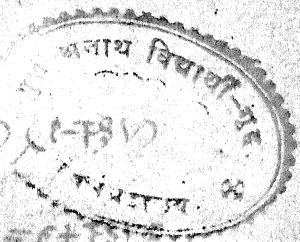
$$\therefore 1 - 2x^3 + x^3 = \frac{x^2}{4} - 2x + 4 + a^2 - 4a$$

$$x^3 - \frac{x^2}{4} = 3 + a^2 - 4a \therefore \frac{3x^3}{4} = 3 + a^2 - 4a$$

$$\therefore \frac{3x\sqrt{3}}{2} = \pm \sqrt{3+4a^2-4a} \therefore x = \pm \frac{2}{\sqrt{3}} \sqrt{3+4a^2-4a}$$

(22)

(23)



$$(21) \sqrt{x} - \frac{c}{x} = \frac{9}{\sqrt{x}-2}$$

दोहोंकडे - $\frac{9}{2}$ मिळऊन $\sqrt{x} - \frac{9}{2} - \frac{c}{x} = -\frac{9}{2} + \frac{9}{\sqrt{x}-2}$

$$\therefore \sqrt{x} - 8 + \frac{9}{2} - \frac{c}{x} = -\frac{9}{2} + \frac{9}{2} \times \frac{2}{\sqrt{x}-2} \text{ कारण } \frac{9}{2} \times \frac{2}{\sqrt{x}-2} = \frac{9}{\sqrt{x}-2}$$

$$(\sqrt{x}-8) + \frac{x-9c}{2x} = \frac{9}{2} \left(\frac{2}{\sqrt{x}-2} \right) \text{ कारण } \frac{9}{2} = \frac{x}{2x}$$

$$(\sqrt{x}-8) + \frac{9}{2x} (x-9c) = \frac{9}{2} \left(\frac{\sqrt{x}-2-2}{\sqrt{x}-2} \right)$$

$$(\sqrt{x}-8) + \frac{9}{2x} (\sqrt{x}+8)(\sqrt{x}-8) = \frac{9}{2} \left(\frac{\sqrt{x}-8}{\sqrt{x}-2} \right)$$

$$\therefore 9 + \frac{9}{2x} (\sqrt{x}+8) = \frac{9}{2} \times \frac{9}{\sqrt{x}-2} \text{ अथवा } \sqrt{x}-8 = 0$$

$$2x + \sqrt{x} + 8 = \frac{-9x}{\sqrt{x}-2} \therefore 2x - 2\sqrt{x} + 3\sqrt{x} + 8 = \frac{-9x}{\sqrt{x}-2}$$

$$-9 \text{ दोहोबाजूस मिळऊन } 2x - 2\sqrt{x} + 3\sqrt{x} - 3 = \frac{-9x}{\sqrt{x}-2}$$

$$2\sqrt{x}(\sqrt{x}-1) + 3(\sqrt{x}-1) = -9 \left(\frac{x}{\sqrt{x}-2} + 1 \right)$$

$$(\sqrt{x}-1)(2\sqrt{x}+3) = -9 \left(\frac{x+\sqrt{x}-2}{\sqrt{x}-2} \right)$$

(28)

$$(\sqrt{x-1})(2\sqrt{x+3}) = -\frac{9}{\sqrt{x-2}}(\sqrt{x-1})(\sqrt{x+2})$$

$$2\sqrt{x+3} = -\frac{9}{\sqrt{x-2}} \times (\sqrt{x+2}) \text{ अथवा } \sqrt{x-1} = 0 \therefore x = 1$$

$$2x + 3\sqrt{x} - 4\sqrt{x} - 6 = 9\sqrt{x} - 18 \text{ छेदसोडऊन}$$

$$2x + 6\sqrt{x} = -6 \therefore x + 3\sqrt{x} = -3 \therefore x = \frac{1}{4}(\sqrt{4+9}-3)^2$$

$$(32) \frac{x + \sqrt{x^2 - a^2}}{x - \sqrt{x^2 - a^2}} = \frac{x}{a} \therefore a(x + \sqrt{x^2 - a^2}) = x(x - \sqrt{x^2 - a^2})$$

$$\text{स्थलांतराने } a\sqrt{x^2 - a^2} + x\sqrt{x^2 - a^2} = x^2 - ax$$

$$\therefore \sqrt{x^2 - a^2}(a+x) = x(x-a) \therefore (x^2 - a^2)(a+x) = x^2(x-a)$$

$$\therefore (x+a)(a+x) = x^2(x-a) \text{ अथवा } x-a=0 \therefore x=a$$

$$\therefore (x+a)^2 = x^2(x-a) \therefore x^2 + 2ax = -a^2$$

$$(33) \sqrt{1+a} \cdot \sqrt{1-x} - \sqrt{1-a} \cdot \sqrt{1+x} = 2a$$

$$(1+a)(1-x) - 2\sqrt{1-a}\sqrt{1+x} + (1-a)(1+x) = 4a^2$$

(२५)

$$2\sqrt{9-a^2}\sqrt{9-k^2} = (9+a)(9-k) + (9-a)(9+k) - 4a^2$$
$$= 9 + a - k - ak + 9 - a + k - ak - 4a^2$$

$$\therefore 2\sqrt{9-a^2}\sqrt{9-k^2} = 2 - 2ak - 4a^2$$

$$\sqrt{9-a^2}\sqrt{9-k^2} = 1 - ak - 2a^2$$

$$9 - k^2 - a^2 + a^2k^2 = 1 - 2ak + a^2k^2 + 4a^2 - 4a^2 - 4a^2k^2$$

$$\therefore k^2 - 2(a - 2a^2)k = 3a^2 - 4a^2$$

$$\therefore k = 3a - 4a^2 \text{ अथवा } -a$$

$$(३४) \frac{k}{(a+k)} + \frac{a}{\sqrt{a+k}} = \frac{2a^2}{k}$$

$$k \text{ नें गुणून } \frac{k^2}{a+k} + a \cdot \frac{k}{\sqrt{a+k}} = 2a^2$$

$$\text{वर्गपूर्णकरून } \frac{k^2}{a+k} + a \frac{k}{\sqrt{a+k}} + \frac{a^2}{4} = \frac{9a^2}{4}$$

(२६)

$$\text{वर्गमूलकादन } \frac{\text{क्ष}}{\sqrt{\text{अ+क्ष}}} + \frac{\text{अ}}{२} = \frac{\text{अ+३अ}}{२} \therefore \frac{\text{क्ष}}{\sqrt{\text{अ+क्ष}}} = \text{अ}$$

$$\text{वर्गकरून } \text{क्ष}^२ = \text{अ} + \text{अ}^२ \therefore \text{क्ष}^२ - \text{अ}^२ = \text{अ}$$

$$\therefore \text{क्ष} = \frac{१}{२} \text{अ} (\text{अ} \pm \sqrt{४\text{अ} + \text{अ}})$$

$$(३५) \text{क्ष} + \text{अ} + ३\sqrt{\text{अबक्ष}} = \text{ब}$$

$$\text{जेव्हा } \sqrt{\text{य}} + \sqrt{\text{अ}} = \sqrt{\text{ब}}$$

$$\text{तेव्हा } \text{य} + \text{अ} + ३\sqrt{\text{अय}} (\sqrt{\text{य}} + \sqrt{\text{अ}}) = \text{ब}$$

$$\text{य} + \text{अ} + ३\sqrt{\text{अय}} \times \sqrt{\text{ब}} = \text{ब} \text{ कारण } \sqrt{\text{य}} + \sqrt{\text{अ}} = \sqrt{\text{ब}}$$

$$\therefore \text{य} + \text{अ} + ३\sqrt{\text{अबय}} = \text{ब} \left. \begin{array}{l} \text{यावरून असेंदिसते कीं } \text{क्ष} = \text{य अ} \\ \text{क्ष} + \text{अ} + ३\sqrt{\text{अबक्ष}} = \text{ब} \end{array} \right\} \text{सावे म्हणजे } \text{क्ष} = (\sqrt{\text{ब}} - \sqrt{\text{अ}})^३$$

$$(३६) \text{अ} + (\text{ब} + \sqrt{\text{क्ष}}) \sqrt{\text{क्ष}} = (\text{ब} - \sqrt{\text{क्ष}}) \sqrt{२\text{अ} + \text{क्ष}}$$
$$\text{अ} + \text{ब} \sqrt{\text{क्ष}} + \text{क्ष} = \text{ब} \sqrt{२\text{अ} + \text{क्ष}} - \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}}$$

$$\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} = \text{ब} \sqrt{२\text{अ} + \text{क्ष}} - \text{ब} \sqrt{\text{क्ष}}$$

$$(\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})^२ = \text{ब}^२ (२\text{अ} + \text{क्ष} - २\sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} + \text{क्ष})$$

(२८)

$$\therefore \text{क्ष} = \frac{(\sqrt{2\text{अब}^2} - \sqrt{\text{अ}^2})}{2\sqrt{2\text{ब}^2}}$$

$$(३७) \frac{9}{\sqrt{\text{क्ष}^2+9}+\text{क्ष}} + \frac{9}{\sqrt{\text{क्ष}^2-9}-\text{क्ष}} = \sqrt{\text{क्ष}^2-9}-2\text{क्ष}$$

अंशासव छेदास सारीक्या पदानें गुणून

$$\frac{\sqrt{\text{क्ष}^2+9}-\text{क्ष}}{\text{क्ष}^2+9-\text{क्ष}^2} + \frac{\sqrt{\text{क्ष}^2-9}+\text{क्ष}}{\text{क्ष}^2-9-\text{क्ष}^2} = \sqrt{\text{क्ष}^2-9}-2\text{क्ष}$$

$$\therefore \frac{\sqrt{\text{क्ष}^2+9}-\text{क्ष}}{9} + \frac{\sqrt{\text{क्ष}^2-9}+\text{क्ष}}{-9} = \sqrt{\text{क्ष}^2-9}-2\text{क्ष}$$

$$\sqrt{\text{क्ष}^2+9}-\text{क्ष}-\sqrt{\text{क्ष}^2-9}-\text{क्ष} = \sqrt{\text{क्ष}^2-9}-2\text{क्ष}$$

$$\therefore \sqrt{\text{क्ष}^2+9}-\sqrt{\text{क्ष}^2-9} = \sqrt{\text{क्ष}^2-9} \therefore \text{क्ष}^2+9-2\sqrt{\text{क्ष}^2-9}+\text{क्ष}^2-9 = \text{क्ष}^2-9$$

$$\text{स्थलांतरानें } 2\text{क्ष} = 3\sqrt{\text{क्ष}^2-9} \therefore 4\text{क्ष}^2 = 9\text{क्ष}^2-9 \therefore \text{क्ष} = \pm \frac{\sqrt{3}}{\sqrt{5}}$$

$$(३८) \text{अ}+\text{क्ष}+\sqrt{2\text{अक्ष}+\text{क्ष}^2} = \sqrt{\text{अक्ष}+\text{क्ष}^2}+\sqrt{2\text{अ}^2-\text{अक्ष}-\text{क्ष}^2}$$

$$\text{अ}+\text{क्ष}+\sqrt{\text{क्ष}\sqrt{2\text{अ}+\text{क्ष}}} = \sqrt{\text{क्ष}\sqrt{\text{अ}-\text{क्ष}}}+\sqrt{\text{अ}-\text{क्ष}}\sqrt{2\text{अ}+\text{क्ष}}$$

(२९)

$$अ + क्ष + \sqrt{क्ष} \sqrt{२अ + क्ष} = \sqrt{अ - क्ष} (\sqrt{क्ष} + \sqrt{२अ + क्ष})$$

$$(\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})^2 = (\text{अ} - \text{क्ष}) (\text{क्ष} + २\text{अ} + \text{क्ष} + २\sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})$$

$$\therefore (\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})^2 = (\text{अ} - \text{क्ष}) (२\text{अ} + २\text{क्ष} + २\sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})$$

$$(\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})^2 = २(\text{अ} - \text{क्ष}) (\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}})$$

$$\therefore \text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} = २(\text{अ} - \text{क्ष}) \text{ अथवा } \text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} =$$

$$\therefore \text{स्थळांतरानें } \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} = \text{अ} - ३\text{क्ष}$$

$$\text{वर्गकरून } २\text{अक्ष} + \text{क्ष}^2 = \text{अ}^2 - ६\text{अक्ष} + ९\text{क्ष}^2$$

$$\therefore \text{स्थ० } ८\text{क्ष}^2 - ८\text{अक्ष} = -\text{अ}^2 \therefore \text{क्ष} = \frac{\text{अ}(\sqrt{२} \pm १)}{२\sqrt{२}}$$

$$\text{जर } \text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} = ० \text{ तर } \text{अ} + \text{क्ष} = -\sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}}$$

$$\therefore \text{अ} + २\text{अक्ष} + \text{क्ष}^2 = २\text{अक्ष} + \text{क्ष}^2 \therefore \text{अ} = ० \therefore \text{अ} = ०$$

यावरून असें दिसते कीं जेव्हा अ=० तेव्हा

$$\text{अ} + \text{क्ष} + \sqrt{\text{क्ष}} \sqrt{२\text{अ} + \text{क्ष}} = \sqrt{२\text{अ} - \text{क्ष}} + \sqrt{\text{अ} - ३\text{अक्ष}}$$

$$20) \sqrt{(1+a)^2 + (1-a)^2} + \sqrt{(1-a)^2 + (1+a)^2} = 2a$$

$$\left(\sqrt{(1+a)^2 + (1-a)^2} + \sqrt{(1-a)^2 + (1+a)^2} \right) \cdot \left(\sqrt{(1+a)^2 + (1-a)^2} - \sqrt{(1-a)^2 + (1+a)^2} \right) = 2a$$

$$(1+a)^2 + (1-a)^2 - (1-a)^2 - (1+a)^2 = 2a$$

$$\sqrt{(1+a)^2 + (1-a)^2} - \sqrt{(1-a)^2 + (1+a)^2} =$$

$$\therefore \sqrt{(1+a)^2 + (1-a)^2} - \sqrt{(1-a)^2 + (1+a)^2} =$$

$$\frac{(1+a)^2 - (1-a)^2 + (1-a)^2 - (1+a)^2}{2a} \quad (20)$$

$$\therefore \sqrt{(1+a)^2 + (1-a)^2} - \sqrt{(1-a)^2 + (1+a)^2} = \frac{4a - 2a}{2a} = 2 - 2a$$

$$\sqrt{(1+a)^2 + (1-a)^2} + \sqrt{(1-a)^2 + (1+a)^2} = 2a \text{ हैं दिलेले समीकरण}$$

$$\therefore 2\sqrt{(1+a)^2 + (1-a)^2} + 2a = 2 - 2a \Rightarrow 2\sqrt{(1+a)^2 + (1-a)^2} = 2 - 4a$$

$$\therefore 2\sqrt{(1+a)^2 + (1-a)^2} = 2(1-2a)$$

$$\text{वर्ग करून } 4(1+a)^2 + 4(1-a)^2 = \{2(1-2a)\}^2$$

$$8\text{क्ष} - 8\text{अक्ष} = -8\text{क्ष} - 8\text{अक्ष} + \text{क्ष}^2$$

$$\therefore \text{क्ष}^2 = 0 \text{क्ष} \therefore \text{क्ष} = 0 \text{ अथवा } \text{क्ष} = 0$$

$$(80) \frac{9 + \sqrt{\text{क्ष}^2 - 9}}{9 + 2\text{अ}\sqrt{\text{क्ष}^2 - 9}} = \frac{\sqrt{\text{क्ष}^2 - 9} - 9}{\text{क्ष}^2 - 2} = \frac{\sqrt{\text{क्ष}^2 - 9} - 9}{\text{क्ष}^2 - 9 - 9}$$

$$\therefore \frac{9 + \sqrt{\text{क्ष}^2 - 9}}{9 + 2\text{अ}\sqrt{\text{क्ष}^2 - 9}} = \frac{(\sqrt{\text{क्ष}^2 - 9} - 9)}{(\sqrt{\text{क्ष}^2 - 9} + 9)(\sqrt{\text{क्ष}^2 - 9} - 9)} = \frac{9}{\sqrt{\text{क्ष}^2 - 9} + 9}$$

$$\therefore (9 + \sqrt{\text{क्ष}^2 - 9})^2 = 9 + 2\text{अ}\sqrt{\text{क्ष}^2 - 9} = 2\text{अ}\sqrt{\text{क्ष}^2 - 9} + 2\text{अ} - 2\text{अ} + 9$$

$$\therefore (9 + \sqrt{\text{क्ष}^2 - 9})^2 = 2\text{अ}(\sqrt{\text{क्ष}^2 - 9} + 9) - 2\text{अ} + 9$$

$$\therefore (9 + \sqrt{\text{क्ष}^2 - 9})^2 - 2\text{अ}(\sqrt{\text{क्ष}^2 - 9} + 9) = -2\text{अ} + 9$$

$$\therefore (9 + \sqrt{\text{क्ष}^2 - 9})^2 - 2\text{अ}(\sqrt{\text{क्ष}^2 - 9} + 9) + \text{अ}^2 = \text{अ}^2 - 2\text{अ} + 9$$

$$\therefore (9 + \sqrt{\text{क्ष}^2 - 9}) - \text{अ} = \pm (\text{अ} - 9)$$

$$\therefore 9 + \sqrt{\text{क्ष}^2 - 9} = \text{अ} \pm (\text{अ} - 9) = 9 \text{ अथवा } 2\text{अ} - 9$$

$$\text{जर } 9 + \sqrt{\text{क्ष}^2 - 9} = 9 \text{ तर } \text{क्ष} = \pm 9$$

(३२)

$$\text{आणिजर } 9 + \sqrt{x^2 - 9} = 2x - 9 \therefore \sqrt{x^2 - 9} = 2x - 2$$

$$\therefore x^2 - 9 = 4(x - 1)^2 \therefore x = \pm \sqrt{4(x - 1)^2 + 9}$$

$$(४९) \frac{(9 + x) + \sqrt{2x + x^2}}{(9 + x) - \sqrt{2x + x^2}} = 9 - x = \frac{9 - x}{1}$$

$$\frac{2(9 + x)}{2\sqrt{2x + x^2}} = \frac{2 - x}{-x} = \frac{x - 2}{x} = 9 - \frac{2}{x}$$

$$\therefore \frac{9 + x}{\sqrt{2x + x^2}} = 9 - \frac{2}{x} \therefore \frac{9 + 2x + x^2}{2x + x^2} = 9 - \frac{2}{x} + \frac{8}{x^2}$$

$$\frac{9}{2x + x^2} + 1 = 9 - \frac{2}{x} + \frac{8}{x^2} \therefore \frac{9}{2x + x^2} = -\frac{2}{x} + \frac{8}{x^2}$$

$$\therefore \frac{9}{2x + x^2} = -\frac{2}{x} + \frac{8}{x^2} \text{ अथवा } x = 0$$

$$\frac{9}{2x + x^2} = \frac{-2x + 8}{x^2} \therefore x^2 = -2x + 8 \therefore x^2 + 2x - 8 = 0 \therefore x =$$

$$8x^2 + x^2 + 2x - 8 = 0 \therefore x =$$

(२३)

$$(४२) ४ \{ (\text{क्ष}^2 - १६)^{\frac{3}{2}} + ३२ \} = \text{क्ष}^2 + १६ (\text{क्ष}^2 - १६)^{\frac{3}{2}}$$

$$४ (\text{क्ष}^2 - १६)^{\frac{3}{2}} + ३२ = \text{क्ष}^2 + १६ (\text{क्ष}^2 - १६)^{\frac{3}{2}}$$

स्थळांतराने $४ (\text{क्ष}^2 - १६)^{\frac{3}{2}} - १६ (\text{क्ष}^2 - १६)^{\frac{3}{2}} = \text{क्ष}^2 - ३२ = (\text{क्ष}^2 - १६) - १६$

$$४ (\text{क्ष}^2 - १६)^{\frac{3}{2}} - १६ (\text{क्ष}^2 - १६)^{\frac{3}{2}} = (\text{क्ष}^2 - १६) - १६$$

$$\therefore ४ (\text{क्ष}^2 - १६)^{\frac{3}{2}} - १६ (\text{क्ष}^2 - १६)^{\frac{3}{2}} = ४ \text{ अथवा } (\text{क्ष}^2 - १६)^{\frac{3}{2}} - ४ = ० \therefore \text{क्ष} = \pm ४\sqrt{२}$$

स्थळांतराने $० = (\text{क्ष}^2 - १६)^{\frac{3}{2}} + ४ - ४ (\text{क्ष}^2 - १६)^{\frac{3}{2}}$

वर्गमूळकाढून $० = (\text{क्ष}^2 - १६)^{\frac{3}{2}} - ४ = ० \therefore (\text{क्ष}^2 - १६)^{\frac{3}{2}} = ४ \therefore \text{क्ष} = \pm ४\sqrt{२}$

$$(४३) \frac{१}{\sqrt{१ - \text{क्ष} + १}} + \frac{१}{\sqrt{१ + \text{क्ष} - १}} = \frac{१}{\text{क्ष}}$$

अंशास व छेदास सारिख्या पदाने गुणून $\frac{\sqrt{१ - \text{क्ष} + १}}{\sqrt{१ - \text{क्ष} + १}} + \frac{\sqrt{१ + \text{क्ष} + १}}{\sqrt{१ + \text{क्ष} + १}} = \frac{१}{\text{क्ष}}$

$$\therefore \frac{\sqrt{१ - \text{क्ष} + १}}{-\text{क्ष}} + \frac{\sqrt{१ + \text{क्ष} + १}}{\text{क्ष}} = \frac{१}{\text{क्ष}} \therefore \frac{\sqrt{१ - \text{क्ष} + १}}{-१} + \frac{\sqrt{१ + \text{क्ष} + १}}{१} = १$$

$$-\sqrt{१ - \text{क्ष} + १} + \sqrt{१ + \text{क्ष} + १} = १ \therefore \sqrt{१ + \text{क्ष} + १} = \sqrt{१ - \text{क्ष} + १} + १$$

वर्गकरून $१ + \text{क्ष} = १ - \text{क्ष} - २\sqrt{१ - \text{क्ष} + १} + १ + २\sqrt{१ - \text{क्ष} + १} + १$

(३४)

$$४-४क्ष=१-४क्ष+४क्ष^२ \therefore ४क्ष^२=४-१=३ \therefore क्ष=\pm \frac{१}{२}\sqrt{३}$$

$$(४४) २क्ष(१-क्ष)^२=अ(१+क्ष)$$

$$\text{वर्गकरून } ४क्ष^२(१-क्ष)=अ(१+२क्ष+क्ष^२)$$

$$४क्ष^२-४क्ष^३=अ+२अक्ष+अक्ष^२$$

$$\text{अक्ष^२ याने सर्व पदभागून } \frac{४क्ष^२}{अक्ष^२} - \frac{४क्ष^३}{अक्ष^२} = \frac{अ}{अक्ष^२} + २ + \frac{अक्ष^२}{अक्ष^२}$$

$$\frac{४}{अक्ष} - \frac{४क्ष^३}{अक्ष} = \frac{१}{क्ष} + २ + क्ष = \frac{१}{क्ष} - २ + क्ष + ४$$

$$\frac{४}{अ} \left(\frac{१}{क्ष} - क्ष \right) = \left(\frac{१}{क्ष} - क्ष \right)^२ + ४ \therefore \left(\frac{१}{क्ष} - क्ष \right)^२ - \frac{४}{अ} \left(\frac{१}{क्ष} - क्ष \right) = \frac{४}{अ}$$

$$\text{वर्गमूक } \left(\frac{१}{क्ष} - क्ष \right)^२ - \frac{४}{अ} \left(\frac{१}{क्ष} - क्ष \right) + \frac{४}{अ} = ४ + \frac{४}{अ}$$

$$\text{वर्गमूका } \left(\frac{१}{क्ष} - क्ष \right) - \frac{२}{अ} = \pm \frac{२}{अ} \sqrt{१-अ}$$

$$\text{स्थळांत } \frac{१}{क्ष} - क्ष = \frac{२}{अ} + \frac{२}{अ} \sqrt{१-अ} = \frac{२}{अ} (१ + \sqrt{१-अ})$$

$$१-क्ष = \frac{२}{अ} (१ + \sqrt{१-अ}) \text{ क्ष: क्ष} + \frac{२}{अ} (१ + \sqrt{१-अ}) \text{ क्ष} = १$$

(३५)

$$\therefore \text{क्ष} = \pm \frac{\sqrt{2}}{2} (9 \pm \sqrt{9-3\alpha}) \stackrel{1}{=} \frac{1}{\alpha} (9 \pm \sqrt{9-3\alpha})$$

$$\text{क्ष} = \pm \left\{ \frac{\sqrt{2}}{2} (9 \pm \sqrt{9-3\alpha}) \right\}^2 \stackrel{2}{=} \frac{1}{\alpha^2} (9 \pm \sqrt{9-3\alpha})^2$$

$$(४७) \left(\frac{2\text{क्ष}+3}{2\text{क्ष}-3} \right)^2 + \left(\frac{2\text{क्ष}-3}{2\text{क्ष}+3} \right)^2 = \frac{8\text{क्ष}^2+9}{9} \cdot \frac{8\text{क्ष}^2-9}{9}$$

$$\text{आतां } \frac{c}{9} \cdot \frac{8\text{क्ष}^2+9}{8\text{क्ष}^2-9} = \frac{8}{9} \cdot \frac{c\text{क्ष}^2+9c}{8\text{क्ष}^2-9} = \frac{8}{9} \cdot \frac{8\text{क्ष}^2+9+8\text{क्ष}^2+9}{8\text{क्ष}^2-9}$$

$$= \frac{8}{9} \left(\frac{8\text{क्ष}^2+9+8\text{क्ष}^2+9+8\text{क्ष}^2-9+8\text{क्ष}^2-9}{8\text{क्ष}^2-9} \right) = \frac{8}{9} \left(\frac{(2\text{क्ष}+3)^2 + (2\text{क्ष}-3)^2}{(2\text{क्ष}+3)(2\text{क्ष}-3)} \right)$$

$$= \frac{8}{9} \left(\frac{(2\text{क्ष}+3)^2}{(2\text{क्ष}+3)(2\text{क्ष}-3)} + \frac{(2\text{क्ष}-3)^2}{(2\text{क्ष}+3)(2\text{क्ष}-3)} \right) = \frac{8}{9} \left(\frac{2\text{क्ष}+3}{2\text{क्ष}-3} + \frac{2\text{क्ष}-3}{2\text{क्ष}+3} \right)$$

$$\therefore \frac{c}{9} \cdot \frac{8\text{क्ष}^2+9}{8\text{क्ष}^2-9} = \frac{8}{9} \left(\frac{2\text{क्ष}+3}{2\text{क्ष}-3} + \frac{2\text{क्ष}-3}{2\text{क्ष}+3} \right)$$

$$\therefore \left(\frac{2\text{क्ष}+3}{2\text{क्ष}-3} \right)^2 + \left(\frac{2\text{क्ष}-3}{2\text{क्ष}+3} \right)^2 = \frac{8}{9} \left(\frac{2\text{क्ष}+3}{2\text{क्ष}-3} + \frac{2\text{क्ष}-3}{2\text{क्ष}+3} \right)$$

(३६)

$$\frac{2x+3}{2x-3} = y \text{ अथवा } \frac{2x-3}{2x+3} = \frac{1}{y} \text{ धरून}$$

$$(y)^3 + \left(\frac{1}{y}\right)^3 = \frac{8}{27} \left(y + \frac{1}{y}\right) \therefore y + \frac{1}{y} = \frac{8}{27} \left(y + \frac{1}{y}\right)$$

$$\therefore y + \frac{1}{y} = \frac{8}{27} \left(y + \frac{1}{y}\right) \left(y + \frac{1}{y}\right) \therefore y + \frac{1}{y} = 0 \therefore y^3 = y - 1$$

$$\text{म्हणून } \frac{2x+3}{2x-3} = y - 1 \text{ कारण } y^3 = \frac{2x+3}{2x-3}$$

$$\therefore 2x+3 = 2x-3 - 3y - 9 \therefore 2x(1-1) = -3(1+y-1)$$

$$\therefore x = -\frac{3}{2} \left(\frac{1+y-1}{1-1}\right) = -\frac{3}{2} \left(\frac{1+y-1}{1-1}\right)^2 = -\frac{3}{2} \left(\frac{1-1+2y-1}{2}\right) = \frac{3y-1}{2}$$

$$\text{आणि जर } 1 = \frac{8}{27} \left(y^3 - 1 + \frac{1}{y}\right) \text{ तर } y^3 + \frac{1}{y} = \frac{10}{8}$$

$$\therefore y^3 + 2 + \frac{1}{y} = \frac{10}{8} \text{ आणि } y^3 - 2 + \frac{1}{y} = \frac{8}{8}$$

$$\therefore y + \frac{1}{y} = \frac{+6}{2} \text{ आणि } y - \frac{1}{y} = \frac{+3}{2} \therefore 2y = \frac{+6}{2} + \frac{3}{2}$$

$$\therefore 2y = 4.5 \text{ अथवा } -4 \text{ अथवा } 9 \text{ अथवा } -9$$



(३७)

$$\therefore y = 2 \text{ अथवा } -2 \text{ अथवा } \frac{1}{2} \text{ अथवा } -\frac{1}{2}$$

$$\therefore y = \frac{2x+3}{2x-3} = 2 \text{ अथवा } -2 \text{ अथवा } \frac{1}{2} \text{ अथवा } -\frac{1}{2}$$

$$(४६) \frac{\sqrt{1+a^2} - a \sqrt{1+k^2}}{\sqrt{1+k^2} - k \sqrt{1+a^2}} = 3$$

छेद खोलकर स्थलांतर $\sqrt{1+a^2} + a \cdot k \sqrt{1+a^2} = 2a \sqrt{1+k^2}$
करून

वर्गक० $(1+a^2) + 2ak \sqrt{1+a^2} + a^2 k^2 (1+a^2) = 4a^2 (1+k^2)$

स्थलांत० $a^2 k^2 (1+a^2) - 4a^2 k^2 + 2ak \sqrt{1+a^2} = 4a^2 (1+k^2)$

$$\therefore k^2 (a^2 + a^2 - 4a^2) + 2a(1+a^2)k = 3a^2 - 1$$

$$\therefore k + \frac{2a(1+a^2)}{a^2 - 3a^2} \times k = \frac{3a^2 - 1}{a^2 - 3a^2}$$

$$k = \frac{1}{a-3a} \left(\pm \sqrt{4(a^2-1)^2 + 2a^2 - (1+a^2)} \right)$$

$$(४७) \text{ अक्ष} + 1 = \frac{2 \text{ अक्ष} \sqrt{a^2 + k}}{a + \sqrt{a^2 + k}}$$

(३८)

$$\text{छेदसोडउनस्थळांत० अ(अक्ष+१) = \sqrt{अ+क्ष}(अक्ष-१)$$

$$\therefore \frac{\sqrt{अ+क्ष}}{अ} = \frac{अक्ष+१}{अक्ष-१} \therefore \frac{अ+क्ष}{अ} = \frac{(अक्ष+१)^२}{(अक्ष-१)^२}$$

$$१ + \frac{क्ष}{अ} = \frac{अ^२ + २अक्ष + १}{अ^२ - २अक्ष + १} = \frac{अ^२ - २अक्ष + १ + ४अक्ष}{अ^२ - २अक्ष + १}$$

$$\therefore १ + \frac{क्ष}{अ} = \frac{अ^२ - २अक्ष + १}{अ^२ - २अक्ष + १} + \frac{४अक्ष}{अ^२ - २अक्ष + १}$$

$$\therefore \frac{क्ष}{अ} = \frac{४अक्ष}{अ^२ - २अक्ष + १} \quad \therefore क्ष = ० \text{ अथवा}$$

$$\frac{१}{अ} = \frac{४अ}{अ^२ - २अक्ष + १} \therefore अ^२ - २अक्ष + १ = ४अ$$

$$\therefore अक्ष - १ = \pm २\sqrt{अ} \therefore क्ष = \frac{१ \pm २\sqrt{अ}}{अ}$$

$$(४८) (अ+क्ष) \sqrt{अ+क्ष} = ६(अ-क्ष)^२$$

(३९)

$$(अ+क्ष)^2 - २अक्ष (अ+क्ष) = ३६ (अ+क्ष)^2 - २अक्ष$$

$$(अ+क्ष)^2 - २अक्ष (अ+क्ष) = ३६ ((अ+क्ष)^2 - ४अक्ष(अ+क्ष) + ४अक्ष^2)$$

$$\text{स्थळानुसार } ३५(अ+क्ष)^2 - १४६अक्ष(अ+क्ष) = -१४४अक्ष^2$$

$$(अ+क्ष)^2 - \frac{१४६अक्ष}{३५} (अ+क्ष) = -\frac{१४४अक्ष^2}{३५}$$

$$\therefore (अ+क्ष) - \frac{१४६}{३५} अक्ष = + \frac{१४४}{३५} अक्ष$$

$$अ+क्ष = \frac{१४६}{३५} अक्ष \text{ अथवा } \frac{६}{५} अक्ष$$

$$\text{जर } अ+क्ष = \frac{१४६}{३५} अक्ष \text{ तर } अ = \frac{१४६-३५अक्ष}{३५}$$

$$\text{आणि जर } अ+क्ष = \frac{६}{५} अक्ष \text{ तर } अ = \frac{६अक्ष-३५अक्ष}{३५} = \frac{२९अक्ष-३५अक्ष}{३५} = \frac{-६अक्ष}{३५}$$

$$(४९) अ(१-क्ष) + \sqrt{अ+१} = अ \sqrt{१+क्ष}$$

$$(१-क्ष) + \frac{\sqrt{अ+१}}{अ} = \sqrt{१+क्ष} \therefore १-क्ष + \sqrt{१+\frac{१}{अ}} = \sqrt{१+क्ष}$$

$$१-२क्ष+क्ष^2+२(१-क्ष)\sqrt{१+\frac{१}{अ}}+१+\frac{१}{अ} = १+क्ष^2$$

(४०)

$$\text{स्थ० } २क्ष + २क्ष \sqrt{१ + \frac{१}{अ}} = १ + २ \sqrt{१ + \frac{१}{अ}}$$
$$\therefore क्ष = \frac{१ + २ \sqrt{१ + \frac{१}{अ}}}{२(१ + \sqrt{१ + \frac{१}{अ}})}$$

$$(५०) \frac{(क्ष-अ)^३}{\sqrt{क्ष}} + २(क्ष-अ) = \frac{अ}{\sqrt{क्ष}} + १$$

$$(क्ष-अ)^३ + २\sqrt{क्ष}(क्ष-अ) = अ + \sqrt{क्ष}$$

$$(क्ष-अ)^३ + २\sqrt{क्ष}(क्ष-अ) + क्ष = अ + क्ष + \sqrt{क्ष}$$

$$(क्ष-अ + \sqrt{क्ष})^३ = अ + अ + क्ष - अ + \sqrt{क्ष}$$

$$(क्ष-अ + \sqrt{क्ष})^३ - (क्ष-अ + \sqrt{क्ष}) = अ + अ$$

$$(क्ष-अ + \sqrt{क्ष})^३ - (क्ष-अ + \sqrt{क्ष}) + \frac{१}{४} = अ + अ + \frac{१}{४}$$

$$(क्ष-अ + \sqrt{क्ष}) - \frac{१}{४} = \pm (अ + \frac{१}{४})$$

$$क्ष + \sqrt{क्ष} = अ + \frac{१}{४} \pm (अ + \frac{१}{४}) = ० \text{ अथवा } २अ + १$$

$$\text{जर } क्ष + \sqrt{क्ष} = ० \text{ अथवा } \sqrt{क्ष} = -१$$

$$\text{आणि जर } क्ष + \sqrt{क्ष} = २अ + १ : \sqrt{क्ष} = \pm \sqrt{२अ + \frac{१}{४}} - \frac{१}{२}$$

(४१)

$$99) \frac{अ+क्ष}{\sqrt{अ+\sqrt{अ+क्ष}}} + \frac{अ-क्ष}{\sqrt{अ-\sqrt{अ-क्ष}}} = \sqrt{अ} \text{ अंशास वळे दाससा}$$

रिख्यापदाने गुणावे

$$\frac{(अ+क्ष)(\sqrt{अ-\sqrt{अ+क्ष}})}{अ-(अ+क्ष)} + \frac{(अ-क्ष)(\sqrt{अ+\sqrt{अ-क्ष}})}{अ-(अ-क्ष)} = \sqrt{अ}$$

$$\frac{अ\sqrt{अ+क्ष}\sqrt{अ-(अ+क्ष)^{\frac{3}{2}}} - क्ष}{-क्ष} + \frac{अ\sqrt{अ-क्ष}\sqrt{अ+(अ-क्ष)^{\frac{3}{2}}} + क्ष}{क्ष} = \sqrt{अ}$$

$$-अ\sqrt{अ-क्ष}\sqrt{अ+(अ+क्ष)^{\frac{3}{2}}} + अ\sqrt{अ+क्ष}\sqrt{अ-(अ-क्ष)^{\frac{3}{2}}} = क्ष\sqrt{अ}$$

$$\text{स्थ० } (अ+क्ष)^{\frac{3}{2}} + (अ-क्ष)^{\frac{3}{2}} = ३क्ष\sqrt{अ}$$

$$\text{वर्गकरून } (अ+क्ष)^2 + २(अ+क्ष) + (अ+क्ष) = ९अक्ष^2$$

$$२अ^2 + ६अक्ष + २(अ+क्ष) = ९अक्ष^2$$

$$२(अ+क्ष)^2 = ३अक्ष^2 - २अ^2$$

$$४(अ+क्ष)^2 = ९अक्ष^2 - १२अक्ष + ४अ^2$$

$$४अ^2 - १२अक्ष + १२अक्ष - ४क्ष^2 = ९अक्ष^2 - १२अक्ष + ४अ^2$$

$$१२अक्ष - ४क्ष^2 = ९अक्ष^2 - ४क्ष^2 = ३अक्ष^2$$

(42)

$$\therefore 4\text{क्ष} = 3\text{अ} \text{ अथवा } \text{क्ष} = 0$$

$$\therefore 2\text{क्ष} = \text{अ} \sqrt{3} \therefore \text{क्ष} = \frac{\text{अ} \sqrt{3}}{2}$$

$$(42) \sqrt{2\text{क्ष}^2 - 1} + \sqrt{1 - \text{क्ष}^2} = \text{अक्ष}$$

$$\sqrt{1 - \text{क्ष}^2} + \sqrt{1 - \text{क्ष}^2} = \text{अक्ष} - \sqrt{2\text{क्ष}^2 - 1}$$

$$1 - \text{क्ष}^2 + \text{क्ष}^2 = \text{अक्ष}^2 - 2\text{अक्ष} \sqrt{2\text{क्ष}^2 - 1} + 2\text{क्ष}^2 - 1$$

$$\text{स्थ. अ} - 2\text{अक्ष} \sqrt{2\text{क्ष}^2 - 1} = 2 - 3\text{क्ष}^2 \dots \dots \dots (A)$$

$$\text{वर्गपू. क. अ} - 2\text{अक्ष} \sqrt{2\text{क्ष}^2 - 1} + 2\text{क्ष}^2 - \text{क्ष}^2 = 2 - 4\text{क्ष}^2 + 2\text{क्ष}^2$$

$$\text{वर्गमूळकाढून अक्ष} \sqrt{2\text{क्ष}^2 - 1} = \sqrt{2 - \text{क्ष}^2} \sqrt{2}$$

$$2\text{अनेंगुणून } 2\text{अ} - 2\text{अक्ष} \sqrt{2\text{क्ष}^2 - 1} = 2\text{अ} \sqrt{2} - 2\text{अक्ष} \sqrt{2}$$

$$\text{अ} - 2\text{अक्ष} \sqrt{2\text{क्ष}^2 - 1} = 2 - 3\text{क्ष}^2 \text{ हें वर आलेले}$$

..... (A) समीकरण

$$\text{ही बाकी अ} = 2\text{अ} \sqrt{2} - 2 - 2\text{अक्ष} \sqrt{2} + 3\text{क्ष}^2$$

$$\therefore \text{क्ष}^2 (3 - 2\text{अ} \sqrt{2}) = \text{अ} - 2\text{अ} \sqrt{2} + 2 = (\text{अ} - \sqrt{2})^2$$

$$\therefore \text{क्ष} \sqrt{3 - 2\text{अ} \sqrt{2}} = \text{अ} - \sqrt{2} \therefore \text{क्ष} = \frac{\text{अ} - \sqrt{2}}{\sqrt{3 - 2\text{अ} \sqrt{2}}}$$

$$(43) (1 + \text{क्ष}) \sqrt{1 + \text{अ}} + (1 - \text{क्ष}) \sqrt{1 - \text{अ}} = 2\sqrt{1 + \text{क्ष}^2}$$

(४३)

$$(1+k)^2(1+a) + 2(1-k)\sqrt{1-a} + (1-k)^2(1-a) = 4(1+k)$$

$$2(1-k)\sqrt{1-a} = 4 + 4k - (1+k)^2(1+a) - (1-k)^2(1-a)$$
$$= 2 + 2k - 4ak$$

$$(1-k)\sqrt{1-a} = 1 + k - 2ak$$

$$\sqrt{1-a} - k\sqrt{1-a} = 1 + k - 2ak$$

$$k(1 + \sqrt{1-a}) - 2ak = \sqrt{1-a} - 1$$

$$k \frac{2a}{1 + \sqrt{1-a}} \cdot k = \frac{\sqrt{1-a} - 1}{\sqrt{1-a} + 1} = \frac{1-a-1}{(\sqrt{1-a}+1)^2} = \frac{-a}{(\sqrt{1-a}+1)^2}$$

$$\text{स्थ० } k \frac{2ak}{\sqrt{1-a}+1} + \frac{a}{(\sqrt{1-a}+1)^2} = 0$$

$$\text{वर्गमूळ } k \frac{a}{\sqrt{1-a}+1} \therefore k = \frac{a}{\sqrt{1-a}+1} = \frac{1-\sqrt{1-a^2}}{a}$$

$$(७४) 2k^2 + (k^2 + 9)^{\frac{2}{3}} = k^3 - 9$$

$$\text{स्थ० } 2k^2 + 9 + \sqrt{k^2 + 9} = k^3$$

$$k^3 = k^2 + 9 + \sqrt{k^2 + 9}$$

= k हे वजा करून

gma 34

(४४)

$$(\text{क्ष}^2+9)+\sqrt{\text{क्ष}^2+9}=\text{क्ष}^2-\text{क्ष}^2 \text{ ही बाकी}$$

$$\text{वर्गपूंक० } ४(\text{क्ष}^2+9)+8\sqrt{\text{क्ष}^2+9}+9=8\text{क्ष}^2-8\text{क्ष}^2+9$$

$$\text{वर्गमूळका० } 2\sqrt{\text{क्ष}^2+9}+9=\pm(2\text{क्ष}^2-9)$$

$$\therefore 2\sqrt{\text{क्ष}^2+9}=\pm(2\text{क्ष}^2-9)-9=2\text{क्ष}^2-2 \text{ अथवा } -2\text{क्ष}^2$$

$$\text{जर } 2\sqrt{\text{क्ष}^2+9}=2\text{क्ष}^2-2 \text{ तर } \sqrt{\text{क्ष}^2+9}=\text{क्ष}^2-1=\text{क्ष}^2+9-10$$

$$\text{स्थ० } (\text{क्ष}^2+9)-\sqrt{\text{क्ष}^2+9}=10$$

$$\text{वर्गपूंकरू० } ४(\text{क्ष}^2+9)-४\sqrt{\text{क्ष}^2+9}+9=४०+9=४९$$

$$\text{वर्गमू०का० } 2\sqrt{\text{क्ष}^2+9}-9=\pm\sqrt{४९} \therefore 2\sqrt{\text{क्ष}^2+9}=9\pm\sqrt{४९}$$

$$\therefore \sqrt{\text{क्ष}^2+9}=\frac{9\pm\sqrt{४९}}{2} \therefore \text{क्ष}^2+9=\frac{9+४९\pm 2\sqrt{४९}}{4}=\frac{५८\pm 2\sqrt{४९}}{4}$$

$$\therefore \text{क्ष}^2=\frac{५\pm 2\sqrt{४९}}{4} \therefore \text{क्ष}=\pm\sqrt{\frac{५\pm 2\sqrt{४९}}{4}}$$

$$\text{आणि जर } 2\sqrt{\text{क्ष}^2+9}=-2\text{क्ष}^2 \text{ तर } \sqrt{\text{क्ष}^2+9}=-\text{क्ष}^2=-\text{क्ष}^2-9+9$$

$$\text{स्थळां० } \text{क्ष}^2+9+\sqrt{\text{क्ष}^2+9}=9 \therefore ४(\text{क्ष}^2+9)+४\sqrt{\text{क्ष}^2+9}+9=3६+9$$

$$\therefore 2\sqrt{\text{क्ष}^2+9}+9=\pm\sqrt{३६} \therefore 2\sqrt{\text{क्ष}^2+9}=\pm\sqrt{३६}-9 \therefore \sqrt{\text{क्ष}^2+9}=\pm\frac{\sqrt{३६}-9}{2}$$

(४९)

$$\therefore \text{क्ष} + ९ = \frac{३७ + १७ + २\sqrt{३७}}{४} \therefore \text{क्ष} = \frac{२७ + २\sqrt{३७}}{४} \therefore \text{क्ष} = \frac{\sqrt{१} + \sqrt{१+४३७}}{२}$$

$$(५५) \text{ अ} + \text{क्ष} \sqrt{१ + \text{अ}^२} = \text{अ} \sqrt{१ - \text{क्ष}^२} + \text{क्ष} \sqrt{१ - \text{अ}^२}$$

$$\text{स्थ०} \text{क्ष} \sqrt{१ + \text{अ}^२} - \text{क्ष} \sqrt{१ - \text{अ}^२} = \text{अ} \sqrt{१ - \text{क्ष}^२} - \text{अ}$$

$$\text{क्ष} (\sqrt{१ + \text{अ}^२} - \sqrt{१ - \text{अ}^२}) = \text{अ} (\sqrt{१ - \text{क्ष}^२} - १) \dots \dots (अ)$$

$$\text{क्ष} \frac{(\sqrt{१ + \text{अ}^२} - \sqrt{१ - \text{अ}^२})(\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२})}{\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२}} = \frac{\text{अ} (\sqrt{१ - \text{क्ष}^२} - 1)(\sqrt{१ - \text{क्ष}^२} + 1)}{\sqrt{१ - \text{क्ष}^२} + 1}$$

$$\therefore \text{क्ष} \frac{(१ + \text{अ}^२ - १ + \text{अ}^२)}{\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२}} = \frac{\text{अ} (१ - \text{क्ष}^२ - १)}{\sqrt{१ - \text{क्ष}^२} + १}$$

$$\frac{२\text{अ}^२ \text{क्ष}}{\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२}} = \frac{-\text{अ} \text{क्ष}^२}{\sqrt{१ - \text{क्ष}^२} + १} \therefore \frac{२\text{अ}}{\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२}} = \frac{-\text{क्ष}}{\sqrt{१ - \text{क्ष}^२} + १}$$

$$\therefore २\text{अ} (\sqrt{१ - \text{क्ष}^२} + १) = -\text{क्ष} (\sqrt{१ + \text{अ}^२} + \sqrt{१ - \text{अ}^२})$$

$$२\text{अ} (\sqrt{१ - \text{क्ष}^२} - १) = २\text{क्ष} (\sqrt{१ + \text{अ}^२} - \sqrt{१ - \text{अ}^२}) \dots \dots (अ)$$

$$\text{बाकी } २\text{अ} (२) = -\text{क्ष} (३\sqrt{१ + \text{अ}^२} - \sqrt{१ - \text{अ}^२})$$

$$\therefore \text{क्ष} = \frac{४\text{अ}}{\sqrt{१ - \text{अ}^२} - ३\sqrt{१ + \text{अ}^२}}$$

(86)

$$(45) \left(x - \frac{2}{3}\right)^2 - \frac{24}{9} = \frac{3x^2 + \frac{8}{9}}{2\left(x - \frac{2}{3}\right) + \sqrt{x^2 - \frac{4x}{3}}}$$

$$\left(x - \frac{2}{3}\right)^2 - \frac{24}{9} = \frac{\left(3x^2 + \frac{8}{9}\right) \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}{\left\{2\left(x - \frac{2}{3}\right) + \sqrt{x^2 - \frac{4x}{3}}\right\} \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}$$

$$x^2 - \frac{2x}{3} - \frac{24}{9} = \frac{\left(3x^2 + \frac{8}{9}\right) \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}{4\left(x - \frac{2}{3}\right)^2 - x^2 + \frac{4x}{3}}$$

$$= \frac{\left(3x^2 + \frac{8}{9}\right) \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}{4x^2 - \frac{4x}{3} + \frac{8}{9} - x^2 + \frac{4x}{3}}$$

$$= \frac{\left(3x^2 + \frac{8}{9}\right) \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}{3x^2 + \frac{8}{9}}$$

$$\therefore x^2 - \frac{2x}{3} - \frac{24}{9} = \frac{\left(3x^2 + \frac{8}{9}\right) \left\{2\left(x - \frac{2}{3}\right) - \sqrt{x^2 - \frac{4x}{3}}\right\}}{\left(3x^2 + \frac{8}{9}\right)}$$

(५७)

$$\therefore \frac{x^2 - 2x - 5}{3} = 2 \left(\frac{x-1}{3} \right) - \sqrt{\frac{x^2 - 5x}{3}} \text{ अथवा } 3x + \frac{8}{3} = 0$$

$$\text{स० } \frac{x^2 - 5x}{3} + \sqrt{\frac{x^2 - 5x}{3}} = \frac{5}{3} - \frac{2}{3} = \frac{3}{3} = 1$$

$$\left(\frac{x^2 - 5x}{3} \right) + \sqrt{\frac{x^2 - 5x}{3}} + \frac{1}{2} = 1 + \frac{1}{2} = \frac{3}{2}$$

$$\sqrt{\frac{x^2 - 5x}{3}} + \frac{1}{2} = \frac{3}{2}$$

$$\therefore \sqrt{\frac{x^2 - 5x}{3}} = \frac{3}{2} - \frac{1}{2} = 1 \text{ अथवा } -2$$

$$\text{जर } \sqrt{\frac{x^2 - 5x}{3}} = 1 \text{ तर } x = 3 \text{ अथवा } -\frac{1}{3}$$

$$\text{आणि जर } \sqrt{\frac{x^2 - 5x}{3}} = -2 \text{ तर } x = \frac{5}{3} \pm \frac{2}{3} \sqrt{9}$$

$$\text{आणि जर } 3x + \frac{8}{3} = 0 \text{ तर } x = -\frac{2}{3} \sqrt{-\frac{1}{3}}$$

$$(५७) \sqrt{\frac{3x}{4} - x} + \sqrt{3x - x} = \frac{3x}{2} \sqrt{1 - 4x}$$

$$\sqrt{\frac{3x}{4} - x} = \frac{3x}{2} \sqrt{1 - 4x} - \sqrt{3x - x}$$

(४८)

$$\frac{3अ-क्ष}{४} * = \frac{९अ^३-९अ^३क्ष-३अ\sqrt{3अक्ष-क्ष}\sqrt{१-४क्ष}}{४}$$

$$+ 3अक्ष-क्ष *$$

$$\frac{3अ-3अक्ष}{४} = \frac{९अ^३-९अ^३क्ष-३अ\sqrt{१-४क्ष}\sqrt{3अक्ष-क्ष}}{४}$$

$$\frac{३अ(१-४क्ष)}{४} = \frac{९अ^३(१-४क्ष)-३अ\sqrt{१-४क्ष}\sqrt{3अक्ष-क्ष}}{४}$$

$$\frac{१}{४}(१-४क्ष) = \frac{३अ(१-४क्ष)-\sqrt{१-४क्ष}\sqrt{क्ष}\sqrt{3अ-१}}{४}$$

$$\frac{१}{४}(१-४क्ष)(१-3अ) = -\sqrt{क्ष}\sqrt{१-४क्ष}\sqrt{3अ-१}$$

$$+\frac{१}{४}(१-४क्ष)(3अ-१) = \sqrt{क्ष}\sqrt{१-४क्ष}\sqrt{3अ-१}$$

$$\frac{१}{४}\sqrt{१-४क्ष}\sqrt{3अ-१} = \sqrt{क्ष}\text{अथवा}\sqrt{१-४क्ष}\sqrt{3अ-१} = 0$$

$$\therefore \frac{\sqrt{१-४क्ष}}{\sqrt{क्ष}} = \frac{४}{\sqrt{3अ-१}} \therefore \frac{१-४क्ष}{क्ष} = \frac{१६}{3अ-१} \therefore \frac{१}{क्ष} - ४ = \frac{१६}{3अ-१}$$

$$\therefore \frac{१}{क्ष} = ४ + \frac{१६}{3अ-१} = \frac{१२अ+१२}{3अ-१} \therefore \frac{१}{क्ष} = \frac{3अ-१}{१२(अ+१)}$$

$$\text{आणिजर } \sqrt{१-४क्ष}\sqrt{3अ-१} = 0 \therefore \sqrt{१-४क्ष} = 0 \therefore \frac{१}{क्ष} = \frac{१}{४}$$

$$(५८) (क्ष+३)^२ - २(क्ष+३) = २क्ष(क्ष+१)^२$$

(४९)

$$\text{स्थ०} (क्ष+३)^२ = २क्ष^२ + ६ + २क्ष(क्ष+१)^२$$

$$-२(क्ष+३) = -२क्ष - ६ \text{ हे मिळवावे.}$$

$$(क्ष+३)^२ - २(क्ष+३) = २क्ष^२ - २क्ष + २क्ष(क्ष+१)^२$$

$$(क्ष+३)^२ - २(क्ष+३) = २क्ष^२ + २क्ष((क्ष+१)^२ - १)$$

$$= २क्ष^२ + २क्ष(क्ष^२ + २क्ष)$$

$$= २क्ष^२ + २क्ष^३(क्ष+२)$$

$$\therefore (क्ष+३)^२ - २(क्ष+३) + १ = २क्ष^३ + १ + २क्ष^३(क्ष+२)$$

$$(क्ष+३-१)^२ = २क्ष^३ + १ + २क्ष^३(क्ष+२)$$

$$\therefore (क्ष+२)^२ - २क्ष^३(क्ष+२) = २क्ष^३ + १$$

$$\therefore (क्ष+२)^२ - २क्ष^३(क्ष+२) + क्ष^३ = क्ष^३ + २क्ष^३ + १$$

$$\therefore क्ष+२ - क्ष^३ = \pm (क्ष^३ + १) \therefore क्ष+२ = क्ष^३ \pm (क्ष^३ + १)$$

$$\therefore क्ष+२ = २क्ष^३ + १ \text{ अथवा } -१$$

$$\text{जर } क्ष+२ = -१ \text{ तर } क्ष = -३$$

$$\text{आणि जर } क्ष+२ = २क्ष^३ + १ \text{ तर } क्ष = १ \text{ अथवा } -\frac{१}{२}$$

(40)

$$(39) \sqrt{x-9} + x\sqrt{x-9} = x^2$$

$$\sqrt{x-9} = x^2 - x\sqrt{x-9}$$

$$\sqrt{x-9} = x^2 - 2x\sqrt{x-9} + x^2 - x^2$$

$$\sqrt{x-9} + 2x\sqrt{x-9} = 2x^2 - x^2$$

$$x^2 - 9 + 4x^2(x-9) + 4x^2(x-9) = 4x^2 - 4x^2 + x^2$$

$$-9 + 4x^2 - 4x^2 + 4x^2 - 4x^2 = 4x^2 - 4x^2$$

$$\therefore -9 + 4x^2 - 4x^2 = 0 \therefore 4x^2 - 4x^2 + 9 = 2$$

$$\therefore 2x^2 - 9 = \pm\sqrt{2} \therefore x^2 = \frac{9 \pm \sqrt{2}}{2} \therefore x = \pm \sqrt{\frac{9 \pm \sqrt{2}}{2}}$$

$$(40) 16(x+2)^{\frac{3}{2}} + \sqrt{x+2} = 32x^2 + 48$$

$$16(x+2)^{\frac{3}{2}} + \sqrt{x+2} = 32x^2 + 48 - 16$$
$$= 32(x+2) - 16$$

$$16(x+2)^{\frac{3}{2}} + 9 = 32(x+2)^{\frac{3}{2}} - 16(x+2)^{\frac{3}{2}}$$

(५१)

$$(\sqrt{x+2})^3 + \frac{3}{96} = 2(\sqrt{x+2})^{\frac{3}{2}} - (\sqrt{x+2})^{\frac{3}{2}}$$

$$(\sqrt{x+2})^3 - 2(\sqrt{x+2})^{\frac{3}{2}} = -(\sqrt{x+2})^{\frac{3}{2}} - \frac{3}{96}$$

$$(\sqrt{x+2})^3 - 2(\sqrt{x+2})^{\frac{3}{2}} + (\sqrt{x+2}) = (\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}} - \frac{3}{96}$$

$$((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}}) = (\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}} - \frac{3}{96}$$

$$((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}})^2 - ((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}}) = -\frac{3}{96}$$

$$((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}})^2 - ((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}}) + \frac{9}{8} = \frac{9}{96}$$

$$((\sqrt{x+2}) - (\sqrt{x+2})^{\frac{3}{2}}) - \frac{9}{2} = \pm \frac{9}{8}$$

$$\therefore (\sqrt{x+2}) - \sqrt{x+2} = \frac{9}{2} \pm \frac{9}{8} = \frac{3}{8} \text{ अथवा } \frac{9}{8}$$

$$\text{जर } (\sqrt{x+2}) - \sqrt{x+2} = \frac{3}{8}$$

$$(\sqrt{x+2}) - \sqrt{x+2} + \frac{9}{8} = 9$$

$$\therefore \sqrt{x+2} - \frac{9}{2} = \pm 9 \therefore \sqrt{x+2} = \frac{9}{2} \pm 9 = \frac{3}{2} \text{ अथवा } \frac{9}{2}$$

$$\therefore \sqrt{x+2} = \frac{9}{8} \text{ अथवा } \frac{9}{8} \therefore \sqrt{x} = \frac{9}{8} \text{ अथवा } -\frac{9}{8}$$

$$\therefore x = \pm \frac{9}{2} \text{ अथवा } \pm \frac{9}{2} - 2$$

(५२)

$$\text{तर } \sqrt{x+2} - \frac{1}{2} = \pm \frac{1}{2} \sqrt{2} \therefore \sqrt{x+2} = \frac{1}{2} (1 \pm \sqrt{2})$$

$$x+2 = \frac{1}{4} (1+2 \pm 2\sqrt{2}) = \frac{1}{4} (3 \pm 2\sqrt{2})$$

$$x = \frac{1}{4} (\pm 2\sqrt{2} - 1) \therefore x = \pm \frac{1}{2} \sqrt{\pm 2\sqrt{2} - 1}$$

(७३) $x(x+a) + b(x+1) = x(a+2) + (2bx-1)$

$$x(x+a+b) + b = ax + 2x + 2bx - 1$$

$$x(x+a+b) + b + x = x + ax + bx + 2bx - 1$$

$$x(x+a+b) - x(x+a+b) + b + x = bx + 2bx - 1$$

$$x(x+a+b)(x-1) + x - 2bx + 1 + b - bx = 0$$

$$x(x+a+b)(x-1) + (x-1)^2 - b(x-1) = 0$$

$$\therefore x(x+a+b) + x - 1 - b = 0 \text{ अथवा } x-1 = 0 \therefore x=1$$

$$x(x+a+b) + x - 1 - b = 0 \therefore x(x+a+b+1) = 1+b$$

(६९) $x - 2\sqrt{x+2} = 1 + \sqrt{x^2 - 3x + 2} = 1 + \sqrt{x+2} \sqrt{x-2}$

$$\therefore (x-1) - \sqrt{x+2} \sqrt{x-1} = 2\sqrt{x+2}$$

(५३)

$$(\sqrt{x-1}) - \sqrt{x+2} \cdot \sqrt{x-1} + \frac{\sqrt{x+2}}{8} = \frac{9}{8} \sqrt{x+2}$$

$$\therefore \sqrt{x-1} - \frac{\sqrt{x+2}}{2} = \frac{3\sqrt{x+2}}{2} \therefore \sqrt{x-1} = 2\sqrt{x+2}$$

$$\therefore x-1 = 4\sqrt{x+2} \therefore x+2 = 3+4\sqrt{x+2}$$

$$\therefore (x+2) - 4\sqrt{x+2} = 3 \therefore \sqrt{x+2} = 2 \pm \sqrt{9} \therefore x = 9 \pm 4 \times 9$$

(६२) $\sqrt{1-a} \cdot \sqrt{\frac{1+x}{1-x}} + \sqrt{1+a} \sqrt{\frac{1-x}{1+x}} = 2\sqrt{1-a^2}$

$$\therefore \sqrt{1-a} \sqrt{\frac{1+x}{1-x}} - 2\sqrt{1-a^2} + \sqrt{1+a} \sqrt{\frac{1-x}{1+x}} = 0$$

वर्गमू. का. $\sqrt{1-a} \sqrt{\frac{1+x}{1-x}} - \sqrt{1+a} \sqrt{\frac{1-x}{1+x}} = 0$

$$\therefore \sqrt{1-a} \sqrt{\frac{1+x}{1-x}} = \sqrt{1+a} \sqrt{\frac{1-x}{1+x}}$$

$$\therefore \sqrt{\frac{(1+x)^2}{(1-x)^2}} = \sqrt{\frac{1+a}{1-a}} \therefore \sqrt{\frac{1+x}{1-x}} = \sqrt{\frac{1+a}{1-a}} \therefore x=1$$

(६३) $\frac{\sqrt{1+x}-1}{\sqrt{1-x}+1} + \frac{\sqrt{1-x}+1}{\sqrt{1+x}-1} = 2a$

$$\therefore \frac{(\sqrt{1+x}-1)(\sqrt{1-x}-1)}{(\sqrt{1-x}+1)(\sqrt{1-x}-1)} + \frac{(\sqrt{1-x}+1)(\sqrt{1-x}+1)}{(\sqrt{1+x}-1)(\sqrt{1-x}+1)} = 2a$$

(५४)

$$\therefore \frac{\sqrt{1-k^2} - \sqrt{1-k} - \sqrt{1+k} + 1}{(1-k) - 1} + \frac{\sqrt{1-k^2} + \sqrt{1-k} + \sqrt{1+k} + 1}{(1+k) - 1} = 2a$$

$$\therefore -\sqrt{1-k^2} + \sqrt{1-k} + \sqrt{1+k} - 1 + \sqrt{1-k^2} + \sqrt{1-k} + \sqrt{1+k} + 1 = 2a$$

$$\therefore 2\sqrt{1-k} + 2\sqrt{1+k} = 2a \therefore \sqrt{1-k} + \sqrt{1+k} = a$$

$$1-k + 2\sqrt{1-k^2} + 1+k = a^2 \therefore 2\sqrt{1-k^2} = a^2 - 2$$

$$4-4k^2 = a^2 - 4 \therefore -4k^2 = a^2 - 4 \therefore k^2 = \frac{4-a^2}{4}$$

$$(69) \frac{1-a+\sqrt{1+a^2} - a\sqrt{1+k^2}}{1-a+\sqrt{1+k^2} - k\sqrt{1+a^2}} = a$$

$$1-a+\sqrt{1+a^2} - a\sqrt{1+k^2} = a - a\sqrt{1+k^2} + a\sqrt{1+k^2} - a\sqrt{1+a^2}$$

$$\therefore k(a\sqrt{1+a^2} + a\sqrt{1+k^2}) = 2a\sqrt{1+k^2} + a - \sqrt{1+a^2}$$

$$k \times n = 2a\sqrt{1+k^2} + m \therefore 2a\sqrt{1+k^2} = nk - m$$

$$4a^2 + 4a^2k^2 = n^2k^2 - 2nmk + m^2$$

$$\therefore k^2(4a^2 - n^2) + 2nmk = m^2 - 4a^2$$

$$(656) (1-k)\sqrt{1+k} - (1+k)\sqrt{1-k} = \frac{\sqrt{2+2\sqrt{1-k}}}{a}$$

$$(1-k)k\sqrt{1+k} - (1+k)k\sqrt{1-k} = \frac{\sqrt{2+2\sqrt{1-k}}}{a}$$

$$\sqrt{1-k} \cdot \sqrt{1+k} \cdot k - \sqrt{1+k} \cdot \sqrt{1-k} \cdot k = \frac{\sqrt{2+2\sqrt{1-k}}}{a}$$

$$k\sqrt{1-k}\sqrt{1+k}(\sqrt{1-k}-\sqrt{1+k}) = \frac{\sqrt{2+2\sqrt{1-k}}}{a} \therefore k(1-k)(2-2\sqrt{1-k}) = \frac{2+2\sqrt{1-k}}{a} \quad (657)$$

$$\therefore k(1-k)(1-\sqrt{1-k}) = \frac{1+\sqrt{1-k}}{a} \quad \text{यास } 1-\sqrt{1-k} \text{ यांना गुणून}$$

$$k(1-k)(1-\sqrt{1-k})^2 = \frac{1+\sqrt{1-k}}{a} \therefore (1-k)(1-\sqrt{1-k})^2 = \frac{1+\sqrt{1-k}}{a}$$

$$\therefore \sqrt{1-k}(1-\sqrt{1-k}) = \frac{1}{a} \therefore \sqrt{1-k} - (1-k) = \frac{1}{a} \therefore \sqrt{1-k} = \frac{1}{a} (+\sqrt{1-k} + 1)$$

$$(659) (1-k)(a(1+k)-2) = (\sqrt{1+k} + \sqrt{1-k}-1) \times \frac{\sqrt{1+k} - \sqrt{1-k}-1}{\sqrt{1+k} - \sqrt{1-k}-1}$$

$$(0-8) \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 = \frac{(1+8 - (38-9))}{\sqrt{1+8} \sqrt{38-9}} = \frac{2-28}{\sqrt{1+8} \sqrt{38-9}} = \frac{2(1-8)}{\sqrt{1+8} \sqrt{38-9}}$$

$$\therefore \sqrt{1+8} - \sqrt{38-9} = \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 \text{ आणि } \sqrt{1+8} + \sqrt{38-9} = (1-8) \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2$$

$$\text{वेरीजेटन } 2\sqrt{1+8} = \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 + (1-8) \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2$$

$$\therefore 2\sqrt{1+8} \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 = 2 + (1-8) \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2$$

$$= 2 + \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 - a(8+1) + 28$$

(६)

$$\therefore \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 + 2\sqrt{1+8} \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 = 2 + 8 - a(8+1) + 28$$

$$\therefore \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 - 2\sqrt{1+8} \left(a \left(1 + \frac{1}{\sqrt{3}} \right) - 2 \right)^2 = 2 + 8 - a(8+1) + 28$$

$$अक्ष+भ-२क्ष=(क्ष+क्ष)(\sqrt{अ-१+१})^2 = क्ष(\sqrt{अ-१+१}) + क्ष(\sqrt{अ-१+१})^2$$

$$\therefore क्ष(\sqrt{अ-१+१}) + क्ष(अ-१+१+२\sqrt{अ-१}) - अक्ष+२क्ष = अ$$

$$\therefore क्ष(\sqrt{अ-१+१}) + क्ष(२+२\sqrt{अ-१}) = अ$$

$$\therefore क्ष(\sqrt{अ-१+१}) + २(१+\sqrt{अ-१})क्ष = अ+१ \therefore क्ष(\sqrt{अ-१+१}) + १ = \pm\sqrt{अ+१}$$

$$\left. \begin{aligned} \frac{१+क्ष-\sqrt{२क्ष+क्ष}}{१+क्ष+\sqrt{२क्ष+क्ष}} = \frac{१\pm\sqrt{२+क्ष+१}}{\sqrt{२+क्ष-१}} \therefore क्ष = \frac{\pm\sqrt{अ+१}-१}{\sqrt{अ-१}+१} \end{aligned} \right\}$$

(६८)

$$\frac{(१+क्ष-\sqrt{२क्ष+क्ष})^2}{(१+क्ष+\sqrt{२क्ष+क्ष})^2} = \text{अ.} \quad \frac{२+क्ष+क्ष+२\sqrt{२क्ष+क्ष}}{२+क्ष+क्ष-२\sqrt{२क्ष+क्ष}}$$

$$\therefore \frac{(१+क्ष-\sqrt{२क्ष+क्ष})^2}{(१+क्ष+\sqrt{२क्ष+क्ष})^2} = \text{अ.} \quad \frac{१+क्ष-\sqrt{२क्ष+क्ष}}{१+क्ष+\sqrt{२क्ष+क्ष}} = \text{अ}$$

(६९)



$$\therefore \frac{1+2\sqrt{1+a^2}}{2\sqrt{1+a^2}} = \frac{a+1}{a-1} \therefore \frac{1+2\sqrt{1+a^2}}{2\sqrt{1+a^2}} = \frac{(a+1)^2}{(a-1)^2}$$

$$\frac{1+2\sqrt{1+a^2}}{(1+2\sqrt{1+a^2}) - (2\sqrt{1+a^2})} = \frac{(a+1)^2}{(a+1)^2 - (a-1)^2} \therefore \frac{(1+2\sqrt{1+a^2})}{4a} = \frac{(a+1)^2}{4a}$$

$$\frac{a+1}{1+2\sqrt{1+a^2}} = \frac{a+1}{2\sqrt{1+a^2}}$$

$$(68) \frac{1+2\sqrt{1+a^2}}{2\sqrt{1+a^2}} + \frac{1-2\sqrt{1+a^2}}{2\sqrt{1+a^2}} = a$$

अंशासककेदास सारिख्यापरमिगुणून

$$\frac{(1+2\sqrt{1+a^2})\{1+2\sqrt{1+a^2}\} + (1-2\sqrt{1+a^2})\{1+2\sqrt{1+a^2}\}}{(1+2\sqrt{1+a^2}) - (1-2\sqrt{1+a^2})} = a$$

$$\frac{(1+2\sqrt{1+a^2})^2 - (1-2\sqrt{1+a^2})^2}{(1+2\sqrt{1+a^2}) - (1-2\sqrt{1+a^2})} = a$$

$$\therefore \frac{(1+x)^2 - (1-x)\sqrt{1+x}}{2x} + \frac{(1-x)^2(1-x)\sqrt{1+x}}{-2x} = \frac{2x}{-2x} = -1$$

$$\therefore (1+x)^2 - (1-x)\sqrt{1+x} - (1-x)^2(1-x)\sqrt{1+x} = 2x$$

$$\therefore (1+x)^2(1-x) + \sqrt{1+x} - (1-x)^2(1+x) = 2x \quad \text{असः } 4x - 2x\sqrt{1+x} = 2x$$

$$4x - 2x\sqrt{1+x} = 2x \quad 1 + x = (1-x)^2 \quad \sqrt{1+x} = \sqrt{(1-x)^2} = 1-x$$

$$(10) \frac{1}{1+x} \left(\frac{1+x}{1-x} + \frac{1}{1-x} \right) = \left(2 \frac{1}{1-x} \right) \left(\frac{1+x}{1-x} \right)$$

$$\therefore \left(\frac{1-x}{1+x} \right)^2 \left(\frac{1+x}{1-x} + \frac{1}{1-x} \right) = \left(2 \frac{1}{1-x} \right) \left(\frac{1+x}{1-x} \right) = \frac{2(1-x)(1+x)}{(1-x)^2} = \frac{2}{1-x}$$

$$\left(\frac{1-x}{1+x} \right) \left(\frac{1-x}{1+x} + \frac{1}{1-x} \right) = \frac{2}{1-x}$$

$$\frac{1-x}{1+x} \left(\frac{1-x}{1+x} + \frac{1}{1-x} \right) = \frac{2}{1-x} \quad \frac{1-x}{1+x} \left(\frac{1-x}{1+x} + \frac{1}{1-x} \right) = \frac{2}{1-x}$$

(10)

$$(अ-क्ष) + 3अक्ष (अ-क्ष) = म-अक्ष (अ-क्ष) + मअक्ष$$

$$(अ-क्ष) + अक्ष (अ-क्ष) \{ 3-म \} = मअक्ष$$

$$\therefore (अ-क्ष) = \frac{अक्ष}{2} \left(+\sqrt{9-2य+ये} - (3-म) \right) = \frac{अक्ष}{2} \times 2स = अक्षसे$$

$$\therefore अक्ष = अक्षस : क्ष - अक्षस = अक्ष$$

$$क्ष - अक्ष + \frac{अक्ष}{2} = अक्ष + \frac{अक्ष}{2} \therefore क्ष = \frac{अक्ष}{2} + \frac{अक्ष}{2} = अक्ष$$

(६)

$$(99) \frac{क्ष - \sqrt{क्ष-अ}}{\sqrt{क्ष} + \sqrt{क्ष-अ}} = \sqrt{क्ष-अ} \left\{ \sqrt{क्ष+अक्ष} - \sqrt{क्ष-अक्ष} \right\}$$

$$\frac{क्ष - \sqrt{क्ष-अ}}{क्ष + \sqrt{क्ष-अ}} = \sqrt{क्ष-अ} \left\{ 2क्ष - 2\sqrt{क्ष-अक्ष} \right\}$$

$$= 2क्ष\sqrt{क्ष-अ} (क्ष - \sqrt{क्ष-अ}) \therefore क्ष - \sqrt{क्ष-अ} = 0 \therefore क्ष = 0$$

(१)

सोडविण्याकरितां समीकरणे.

$$(१) \frac{१४x^2 + १५}{२१} - \frac{२x^2 + ८}{८x^2 - ११} = \frac{२x^2}{३}$$

$$(२) \frac{१०x^2 + १७}{१८} - \frac{१२x^2 + २}{११x^2 - ८} = \frac{५x^2 - ४}{९}$$

$$(३) \frac{x}{x-२} + \frac{x-९}{x-७} = \frac{x+१}{x-१} + \frac{x-८}{x-६}$$

$$(४) \frac{२१+५x}{२+x} + \frac{६-१२x}{३-x} = \frac{१२१+१६x}{७+x} + \frac{५-२x}{३-x}$$

$$(५) x-३ = \frac{१+४\sqrt{x}}{x}$$

$$(६) \frac{१+x^2}{(१+x)^5} = \frac{११}{२१}$$

$$(७) x^2-७ = \sqrt{x^2-४२x+८९}$$

$$(८) \sqrt{x^2+१} = x-१+३\sqrt{x}$$

$$(९) (१+x)(१+x^2)(१+x^4) = ३०x^2$$

$$(१०) x^2-४x\sqrt{x} = x+२\sqrt{x}+3$$

$$(११) (x-२)^3 + २x(\sqrt{x-१})^2 = १७\frac{१}{४}x + १४\sqrt{x}$$

$$(१२) x^2(x-१) - २x^2(x+२k) - ५x^2(x+४k) = -१$$

(2)

$$(93) \quad a + \sqrt{a^2 + b^2} = \frac{2a}{\sqrt{a^2 + b^2}}$$

$$(94) \quad \sqrt{a^2 + \sqrt{a^2 + b^2}} + \sqrt{b^2 + \sqrt{b^2 + a^2}} = 2b$$

$$(95) \quad \sqrt[3]{1-3a+2a^2} + \sqrt[3]{4a^3+9a^2+9a+4} = \sqrt[3]{1-4a^2+4a^3}$$

$$(96) \quad \sqrt[3]{a^3+b^3} + \sqrt[3]{a^3-b^3} = a\sqrt[3]{1+b/a} + a\sqrt[3]{1-b/a}$$

$$(97) \quad \frac{\sqrt{a^2-b^2} - \sqrt{b^2-a^2}}{\sqrt{a^2+b^2} + \sqrt{b^2+a^2}} = \frac{a}{b}$$

$$(98) \quad \frac{1}{a - \sqrt{a^2 + b^2}} - \frac{1}{a + \sqrt{a^2 + b^2}} = \frac{a}{b^2}$$

$$(99) \quad \frac{\sqrt[3]{a^2+b^2} + \sqrt[3]{a^2-b^2}}{\sqrt[3]{a+b} + \sqrt[3]{a-b}} = \sqrt[3]{a}$$

$$(100) \quad a + \sqrt{a^2 - b^2} = \sqrt{ab(a - \sqrt{a^2 - b^2})}$$

$$(101) \quad \frac{b}{2}(a + \sqrt{a^2 - b^2}) = (\sqrt{a+b} - \sqrt{a-b})^4$$

$$(102) \quad \frac{(a-1)a + a^2 - b\sqrt{a-1}}{(a+1)a + a^2 + b\sqrt{a+1}} = \frac{(1-a)(1+ab)^2 - ab}{1}$$

$$(103) \quad \frac{2a + \sqrt{a^2 + b^2}}{2a - \sqrt{a^2 + b^2}} = \frac{2a + \sqrt{a^2 + b^2}}{2b - \sqrt{a^2 - b^2}}$$

(३)

$$(२४) \frac{\{२७अ+८क्ष\}^{\frac{३}{२}}}{१५क्ष^{\frac{३}{२}}} + \frac{८क्ष^{\frac{३}{२}}}{२(२७अ+८क्ष)^{\frac{३}{२}}} = \frac{४}{५\sqrt{क्ष}}$$

$$(२५) \frac{१+क्ष+\sqrt{१+क्ष}}{१-क्ष+\sqrt{१-क्ष}} = \frac{क्ष}{\sqrt{१-क्ष}+(१-क्ष)\sqrt{१+क्ष}}$$

$$(२६) \frac{अ+क्ष+\sqrt{अ^२+क्ष^२}}{अ+क्ष-\sqrt{अ^२+क्ष^२}} = \frac{न(\sqrt{अ+क्ष})+म\sqrt{अक्ष}}{न(\sqrt{अ+क्ष})-म\sqrt{अक्ष}}$$

$$(२७) \frac{\sqrt{अ+क्ष}+\sqrt{अक्ष}}{\sqrt{अ+क्ष}-\sqrt{अक्ष}} = \frac{४(अ+क्ष)}{(अ+क्ष)^२-२अक्ष(अ+क्ष)}$$

$$(२८) \frac{म(२अ-क्ष+२\sqrt{अ^२-अक्ष})}{क(२अ+क्ष+२\sqrt{अ^२+अक्ष})} = \frac{व(\sqrt{अ+क्ष})}{ड(\sqrt{अ-क्ष})}$$

$$(२९) \frac{(अ-क्ष)^{\frac{३}{२}}+४(अ+क्ष)^{\frac{३}{२}}}{४(अ-क्ष)^{\frac{३}{२}}} + \frac{(अ+क्ष)^{\frac{३}{२}}+४(अ-क्ष)^{\frac{३}{२}}}{४(अ+क्ष)^{\frac{३}{२}}} =$$
$$(\sqrt{अ-क्ष}-\frac{३}{२})+\frac{३}{४}$$

योगें सोडविण्याकरितां दिलेले समीकरणांची उत्तरे.

(१) क्ष=±२; (२) क्ष=±२; (३) क्ष=४; (४) क्ष=२१२;

(५) क्ष=३±२√२; (६) क्ष=२; (७) क्ष=२अथवा-५

(४)

$$(८) x = \frac{1}{2} \text{ अथवा } \frac{31 \pm 90\sqrt{34}}{32}; (9) x = \frac{3 \pm \sqrt{5}}{2};$$

$$(10) x = \frac{5}{2} \pm \sqrt{6}; (11) x = 2.228; (12)$$

$$(13) x = \pm \frac{a(n-1)}{\sqrt{2n-1}}; (14) x = (\sqrt{b} - \sqrt{a})^2;$$

$$(15) x = \frac{1}{2(2\sqrt{9})} (\pm \sqrt{100 + 90 \times \frac{m}{2} + 25 - 3(1 + \frac{m}{2})});$$

$$(16) x = 0 \text{ अथवा } \sqrt{n}; (17) x = \sqrt{\frac{(a-b) \times (d+c)}{8कड}} - (a+b);$$

$$(18) x = \pm \frac{a\sqrt{3}}{2} \text{ अथवा } 0; (19) x = \pm a\sqrt{-1} \text{ अथवा } a \text{ अथवा } 0;$$

$$(20) x = \frac{2am}{1+m} \text{ अथवा } 0; (21) x = \frac{8a}{5} \text{ अथवा } 0;$$

$$(22) x = \pm \sqrt{1-a} \times \frac{1+a\sqrt{1-a}}{a+\sqrt{1-a}}; (23) x = \frac{10a}{9} \text{ अथवा } 0;$$

$$(24) x = \frac{2a}{3} (2 + \sqrt{2}); (25) x = 0;$$

$$(26) x = \frac{a}{2m^2} (\pm \sqrt{n^2 + 2nm - 2m^2} + (m+n));$$

$$(27) x = \frac{a}{2} (1 \pm \sqrt{-3}) \text{ अथवा } 2 \pm \sqrt{3};$$

$$(28) x = 0 \text{ अथवा } \frac{8a \sqrt{कडम} (डमडे - (कडेडे))}{\sqrt{(डमडे + (कडेडे))}};$$

$$(29) x = \pm \sqrt{a} \sqrt{a-v-2a} \text{ अथवा } \pm \sqrt{a} \sqrt{a-v} a;$$

समाप्त.